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B.C. Mines 1909

ANNUAL REPORT

OF THE

MINISTER OF MINES

FOR THE

YEAR ENDING 31st DECEMBER,

1909,

BEING AN ACCOUNT OF

MINING OPERATIONS FOR GOLD, COAL, ETC.,

IN THE

PROVINCE OF BRITISH COLUMBIA.

THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

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PRINTED BY AUTHORITY OF
THE LEGISLATIVE ASSEMBLY OF BRITISH COLUMBIA.

VICTORIA, B.C.:
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REPORT

OF THE

MINISTER OF MINES,

1909.

To His Honour the Honourable Thomas W. Paterson,
Lieutenant-Governor of the Province of British Columbia:

May it please Your Honour:

The Annual Report of the Provincial Mineralogist upon the Mining Industries of the Province for the year 1909 is herewith respectfully submitted.

RICHARD McBRIDE,
Minister of Mines.

Minister of Mines Office,
March, 1910.

RAWHIDE, GOLD-DROP, AND SNOWSHOE MINES, PHOENIX.

REPORT OF BUREAU OF MINES.

—BY—

WILLIAM FLEET ROBERTSON, PROVINCIAL MINERALOGIST.

———:o:———

To the Hon. Richard McBride,
Minister of Mines.

Sir,—I have the honour to submit herewith my Annual Report on the Mining Industry of the Province for the year ending December 31st, 1909.

The statistical tables give the total mineral output of the Province to date, and show in considerable detail the actual mineral production of the past year, as based on smelter or mill returns; also, a summary of the production of each of the last four years, thus illustrating by comparison the progress made in productive mining during this period.

To facilitate comparison with information previously given, I have retained, as closely as was possible, the general form already established for such tables and for the Report.

I have the honour to be,
Sir,
Your obedient servant,

William Fleet Robertson,
Provincial Mineralogist.

Bureau of Mines, Victoria, B. C.,
March, 1910.

MINERAL PRODUCTION OF BRITISH COLUMBIA.

———:o:———

METHOD OF COMPUTING PRODUCTION.

In assembling the output for the lode mines in the following tables, the established custom of this Bureau has been adhered to, viz.: The output of a mine for the year is considered that amount of ore for which the smelter or mill returns have been received during the year. This system does not give the exact amount mined during the year, but rather the amounts credited to the mine on the company's books during such year.

For ore shipped in December the smelter returns are not likely to be received until February in the new year, or later, and have, consequently, to be carried over to the credit of such new year. This plan, however, will be found very approximate for each year, and ultimately correct, as ore not credited to one year is credited in the next.

In the lode mines tables, the amount of the shipments has been obtained from certified returns received from the various mines, as provided for in the "Inspection of Metalliferous Mines Act, 1897." In calculating the values of the products, the average price for the year in the New York Metal Market has been used as a basis. For silver 95 per cent., and for lead 90 per cent., of such market price has been taken. Treatment and other charges have not been deducted.

TABLE I.—Total Production for all Years up to and Including 1909.

Gold, placer	$ 70,673,103
Gold, lode	55,277,687
Silver	29,850,586
Lead	23,259,255
Copper	55,871,893
Coal and Coke	102,904,261
Building stone, bricks, etc.	9,093,100
Other metals	890,699
Total	$347,820,584

TABLE II.—Production for each Year from 1890 to 1909 (inclusive).

1852 to 1889 (inclusive)	$ 71,981,634
1890	2,608,803
1891	3,521,102
1892	2,978,530
1893	3,588,413
1894	4,225,717
1895	5,643,042
1896	7,507,956
1897	10,455,268
1898	10,906,861
1899	12,393,131
1900	16,344,751
1901	20,086,780
1902	17,486,550
1903	17,495,954
1904	18,977,359
1905	22,461,325
1906	24,980,546
1907	25,882,560
1908	23,851,277
1909	24,443,025
Total	$347,820,584

TABLE III.

SHOWING MINERAL PRODUCTION

OF

BRITISH COLUMBIA.

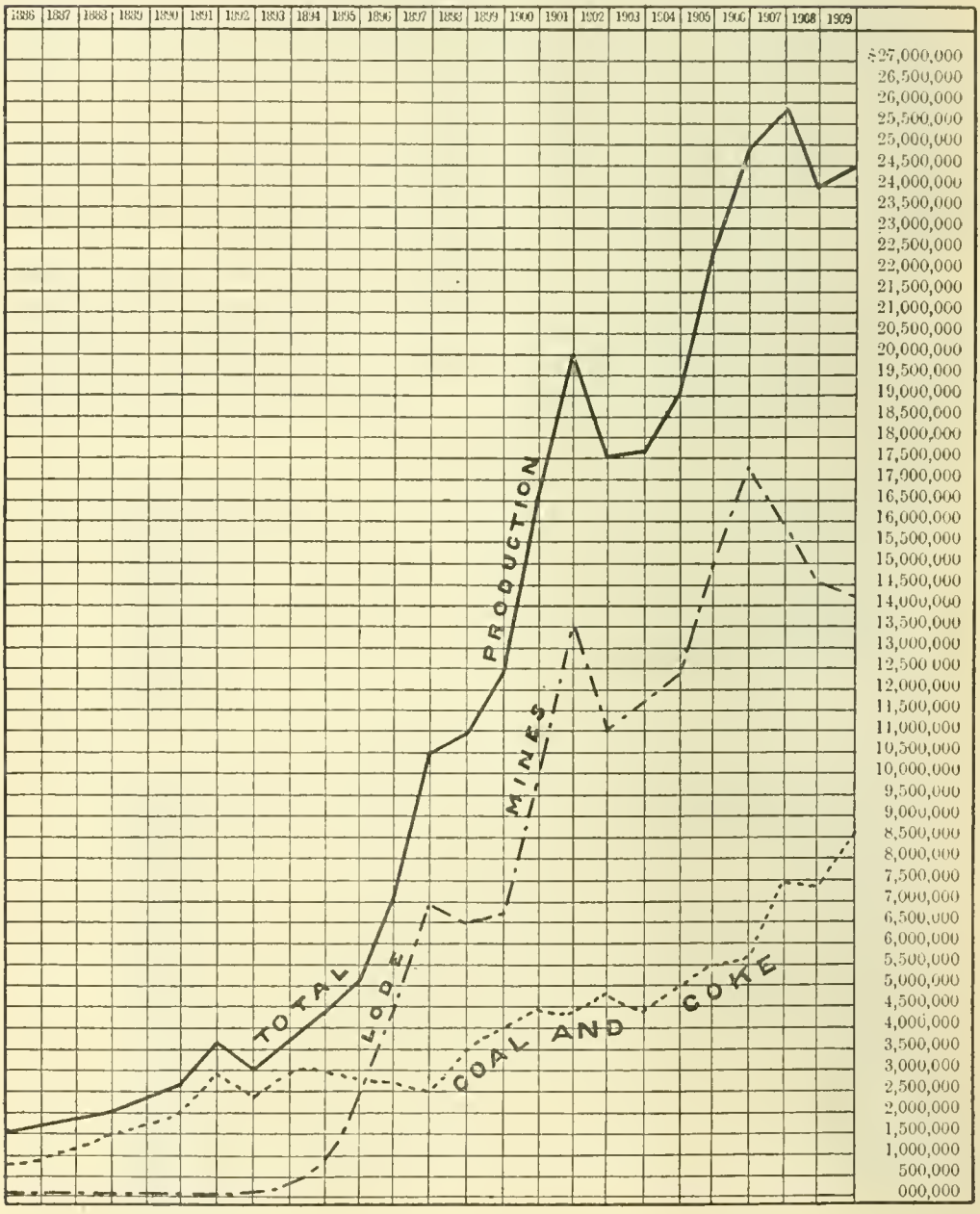


Table IV. gives a statement in detail of the quantities and value of the different mineral products for the years 1907, 1908 and 1909. As it has been impossible as yet to collect accurate statistics regarding building stone, lime, bricks, tiles, etc., these are estimated.

TABLE IV.

QUANTITIES AND VALUE OF MINERAL PRODUCTS FOR 1907, 1908 AND 1909.

	Customary Measure.	1907.		1908.		1909.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Gold, placer	Ounces.	41,400	$ 828,000		$ 647,000		$ 477,000
" lode	"	196,179	4,055,020	255,582	5,282,880	238,224	4,924,090
Silver	"	2,745,448	1,703,825	2,631,389	1,321,483	2,532,742	1,239,270
Lead	Pounds	47,738,703	2,291,458	43,195,733	1,632,799	44,396,346	1,709,259
Copper	"	40,832,720	8,166,544	47,274,614	6,240,249	45,597,245	5,918,522
Coal	Tons, 2,240lbs	1,800,067	6,300,235	1,677,849	5,872,472	2,006,476	7,022,666
Coke	" "	222,913	1,337,478	247,399	1,484,394	258,703	1,552,218
Other materials			1,200,000		1,370,000		1,600,000
			$25,882,560		$23,851,277		$24,443,025

TABLE V.

PRODUCTION OF MINERAL BY DISTRICTS AND DIVISIONS.

NAMES.	DIVISIONS.			DISTRICTS.		
	1907.	1908.	1909.	1907.	1908.	1909.
CARIBOO DISTRICT				$ 360,500	$ 405,000	$ 247,000
Cariboo Mining Division	$ 306,500	$ 355,000	$ 220,000			
Quesnel "	44,000	30,000	12,000			
Omineca "	10,000	20,000	15,000			
CASSIAR DISTRICT				572,809	298,234	234,498
EAST KOOTENAY DISTRICT				5,548,880	4,802,680	4,766,215
WEST KOOTENAY DISTRICT				4,792,976	5,448,224	5,169,749
Ainsworth Division	364,868	422,181	617,340			
Nelson "	614,395	462,836	584,955			
Slocan "	619,842	676,580	954,737			
Trail Creek "	3,049,702	3,713,392	2,875,084			
Other parts	144,169	173,235	137,633			
LILLOOET DISTRICT				15,721	13,779	16,676
YALE DISTRICT				8,444,326	7,649,963	7,728,256
Osoyoos, Grand Forks & Greenwood Divisions	8,354,995	7,545,380	7,501,046			
Similkameen & Nicola Divisions	56,564	101,583	225,210			
Yale Division	52,767	3,000	2,000			
COAST DISTRICTS (Nanaimo, Alberni, Clayoquot, Quatsino, Victoria)				6,147,348	5,233,397	6,280,631
				$25,882,560	$23,851,277	$24,443,025

TABLE VI.—Placer Gold.

Table VI. contains the yearly production of placer gold to date, as determined by the returns, sent in by the banks and express companies, of gold transmitted by them to the mints, and from returns sent in by the Gold Commissioners and Mining Recorders. To these yearly amounts one-third was added up to the year 1878, from then to 1895 and from 1898 to 1909, one-fifth, which proportions are considered to represent, approximately, the amount of gold sold of which there is no record. This placer gold contains from 10 to 25 per cent. silver, but the silver value has not been separated from the totals, as it would be insignificant.

Yield of Placer Gold per Year to Date.

1858	$ 705,000	1876	$1,786,648	1893	$ 356,131
1859	1,615,070	1877	1,608,182	1894	405,516
1860	2,228,543	1878	1,275,204	1895	481,683
1861	2,666,118	1879	1,290,058	1896	544,026
1862	2,656,903	1880	1,013,827	1897	513,520
1863	3,913,563	1881	1,046,737	1898	643,346
1864	3,735,850	1882	954,085	1899	1,344,900
1865	3,491,205	1883	794,252	1900	1,278,724
1866	2,662,106	1884	736,165	1901	970,100
1867	2,480,868	1885	713,738	1902	1,073,140
1868	3,372,972	1886	903,651	1903	1,060,420
1869	1,774,978	1887	693,709	1904	1,115,300
1870	1,336,956	1888	616,731	1905	969,300
1871	1,799,440	1889	588,923	1906	948,400
1872	1,610,972	1890	490,435	1907	828,000
1873	1,305,749	1891	429,811	1908	647,000
1874	1,844,618	1892	399,526	1909	477,000
1875	2,474,004				
				Total	$70,673,103

TABLE VII.—Production of Lode Mines.*

Year.	Gold.		Silver.		Lead.		Copper.		Total Values.
	Oz.	Value.	Oz.	Value.	Pounds.	Value.	Pounds.	Value.	
		$		$		$		$	$
1887			17,690	17,331	204,800	9,216			26,547
1888			79,780	75,000	674,500	29,813			104,813
1889			53,192	47,873	165,100	6,498			54,371
1890			70,427	73,948	*Nil.*	*Nil.*			73,948
1891			4,500	4,000	*Nil.*	*Nil.*			4,000
1892			77,160	66,935	808,420	33,064			99,999
1893	1,170	23,404	227,000	195,000	2,135,023	78,996			297,400
1894	6,252	125,014	746,379	470,219	5,662,523	169,875	324,680	16,234	781,342
1895	39,264	785,271	1,496,522	977,229	16,475,464	532,255	952,840	47,642	2,342,397
1896	62,259	1,244,180	3,135,343	2,100,689	24,199,977	721,384	3,818,556	190,926	4,257,179
1897	106,141	2,122,820	5,472,971	3,272,836	38,841,135	1,390,517	5,325,180	266,258	7,052,431
1898	110,061	2,201,217	4,292,401	2,375,841	31,693,559	1,077,581	7,271,678	874,781	6,529,420
1899	138,315	2,857,573	2,939,413	1,663,708	21,862,436	878,870	7,722,591	1,351,453	6,751,604
1900	167,153	3,453,381	3,958,175	2,309,200	63,358,621	2,691,887	9,997,080	1,615,289	10,069,757
1901	210,384	4,348,603	5,151,333	2,884,745	51,582,906	2,002,733	27,603,746	4,446,963	13,683,044
1902	236,491	4,888,269	3,917,917	1,941,328	22,536,381	824,832	29,636,057	3,446,673	11,101,102
1903	232,831	4,812,616	2,996,204	1,521,472	18,089,283	689,744	34,359,921	4,547,535	11,571,367
1904	222,042	4,589,608	3,222,481	1,719,516	36,646,244	1,421,874	35,710,128	4,578,037	12,309,035
1905	238,660	4,933,102	3,439,417	1,971,818	56,580,703	2,399,022	37,692,251	5,876,222	15,180,164
1906	224,027	4,630,639	2,990,262	1,897,320	52,408,217	2,667,578	42,990,488	8,288,565	17,484,102
1907	196,179	4,055,020	2,745,448	1,703,825	47,738,703	2,291,458	40,832,720	8,166,544	16,216,847
1908	255,582	5,282,880	2,631,389	1,321,483	43,195,733	1,632,799	47,274,614	6,240,249	14,477,411
1909	238,224	4,924,090	2,532,742	1,239,270	44,396,346	1,709,259	45,597,245	5,918,522	13,791,141
To'l	2,685,035	55,277,687	52,198,146	29,850,586	579,256,074	23,259,255	377,109,775	55,871,893	164,259,421

* The information as to production in the earlier years is obtained from the "Mineral Statistics and Mines" for 1896, Geological Survey of Canada.

TABLE VIII.—COAL AND COKE PRODUCTION PER YEAR TO DATE.

COAL.

YEARS.	TONS (2,240 lbs).	VALUE.
1836-73	480,872	$ 1,824,140
1874	81,547	244,641
1875	110,145	330,435
1876	139,192	417,576
1877	154,052	462,156
1878	170,846	512,538
1879	241,301	723,903
1880	267,595	802,785
1881	228,357	685,071
1882	282,139	846,417
1883	213,299	639,897
1884	394,070	1,182,210
1885	265,596	796,788
1886	326,636	979,908
1887	413,360	1,240,080
1888	489,301	1,467,903
1889	579,830	1,739,490
1890	678,140	2,034,420
1891	1,029,097	3,087,291
1892	826,335	2,479,005
1893	978,294	2,934,882
1894	1,012,953	3,038,859
1895	939,654	2,818,962
1896	896,222	2,688,666
1897	882,854	2,648,562
1898	1,135,865	3,407,595
1899	1,306,324	3,918,972
1900	1,439,595	4,318,785
1901	1,460,331	4,380,993
1902	1,397,394	4,192,182
1903	1,168,194	3,504,582
1904	1,253,628	3,760,884
1905	1,384,312	4,152,936
1906	1,517,303	4,551,909
1907	1,800,067	6,300,235
1908	1,677,849	5,872,472
1909	2,006,476	7,022,666
Total	29,629,025 tons.	$92,010,796

COKE.

1895–97	19,396	$ 96,980
1898 (estimated)	35,000	175,000
1899	34,251	171,255
1900	85,149	425,745
1901	127,081	635,405
1902	128,015	640,075
1903	165,543	827,715
1904	238,428	1,192,140
1905	271,785	1,358,925
1906	199,227	996,135
1907	222,913	1,337,478
1908	247,399	1,484,394
1909	258,703	1,552,218
Total	2,032,890 tons.	$10,893,465

TABLE IX.—PRODUCTION IN DETAIL OF THE

DISTRICT.	YEAR	TONS.	GOLD—PLACER.		GOLD—LODE.		SILVER.		LEAD.	
			Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Pounds.	Value.
				$		$		$		$
Cariboo										
Cariboo Division	1906		17,790	355,800						
	1907		15,325	306,500						
	1908		17,750	355,000						
	1909		11,000	220,000						
Quesnel "	1906		1,980	39,600						
	1907		2,200	44,000						
	1908		1,500	30,000						
	1909		600	12,000						
Omineca "	1906		500	10,000						
	1907		500	10,000						
	1908		1,000	20,000						
	1909		750	15,000						
Cassiar										
Atlin Division	1906		22,750	455,000						
	1907		20,400	408,000						
	1908	2	10,150	203,000			90	45		
	1909	9	10,000	200,000			353	173		
Liard, Stikine, Skeena and Queen Charlotte Divisions	1906	5,394	2,200	44,000	2	41	26	16		
	1907	9,611	1,250	25,000	165	3,416	2,291	1,422		
	1908	6,928	450	9,000	693	14,324	14,079	7,070		
	1909	4,260	450	9,000	261	5,395	4,216	2,063		
East Kootenay										
Fort Steele Division	1906	180,036	520	10,400			1,049,536	665,931	44,487,481	2,264,413
	1907	154,963	500	10,000	6	124	821,367	509 740	37,526,194	1,801,257
	1908	165,313	170	3,400			641,855	322,340	30,204,788	1,141,741
	1909	149,630	150	3,000			580,240	283,911	27,004,528	1,039,674
Windermere-Golden	1906	243			10	207	22,174	14,069	167,691	8,535
	1907	64					3,955	2,455	73,842	3,544
	1908	714	20	400			3,384	1,699	358,270	13,543
	1909	20					825	404	18,724	721
West Kootenay										
Ainsworth Division	1906	19,431			19	393	165,915	105,273	3,173,353	161,524
	1907	17,781			118	2,439	301,322	187,000	3,654,775	175,429
	1908	38,282			162	3,349	314,142	157,762	4,790,216	181,070
	1909	97,698			162	3,349	352,555	172,505	10,298,343	396,486
Nelson "	1906	50,135	50	1,000	11,677	241,364	211,122	133,957	1,034,553	52,659
	1907	52,693	50	1,000	13,383	276,627	236,837	146,981	1,582,113	75,942
	1908	24,854	50	1,000	17,376	359,162	25,067	12,589	345,424	13,057
	1909	36,814	50	1,000	21,909	452,859	75,309	37,142	1,097,069	42,237
Slocan & Slocan City	1906	14,973			69	1,426	571,613	362,688	2,975,674	151,462
	1907	18,412			14	289	590,998	366,773	4,305,826	206,680
	1908	23,309			96	1,984	848,595	426,164	6,572,268	248,432
	1909	28,306			95	1,964	738,175	361,189	4,976,199	191,584
Trail Creek	1906	279,527			105,356	2,177,709	126,174	80,057		
	1907	285,923			94,573	1,954,824	126,661	78,606	4,514	217
	1908	302,419			142,314	2,941,630	129,558	65,064	29,692	1,122
	1909	237,656			115,153	2,380,213	80,026	39,157	3,315	128
Revelstoke, Trout Lake and Lardeau Divisions.	1906	8,715	200	4,000	2,048	42,332	79,262	50,292	469,000	23,872
	1907	6,845	250	5,000	1,168	24,143	122,232	75,857	566,020	27,169
	1908	2,819	250	5,000	870	17,983	173,675	87,220	873,860	33,032
	1909	1,750	100	2,000	732	15,130	169,435	82,904	976,601	37,599
Lillooet										
Lillooet and Clinton M. D.	1906	215	840	16,800	170	3,514				
	1907	309	600	12,000	180	3,721				
	1908	15	660	13,200	28	579				
	1909	430	500	10,000	323	6,676				
Yale—BOUNDARY (Grand Forks, Greenwood and Osoyoos Divisions.)	1906	1,182,517	165	3,300	94,125	1,945,564	671,661	426,169	100,465	5,113
	1907	1,173,416	75	1,500	81,218	1,678,776	469,206	291,189	25,419	1,220
	1908	1,491,063	100	2,000	91,551	1,892,359	451,323	226,654	21,215	802
	1909	1,461,533	50	1,000	93,229	1,927,043	492,333	240,898	21,567	830
Similkameen, Nicola, and Vernon Div'ns.	1906	3	125	2,500	6	124				
	1907	11	50	1,000			14	9		
	1908	57	50	1,000			23	12		
	1909		50	1,000						
Yale, Ashcroft and Kamloops Divisions	1906	3,837	250	5,000	215	4,444	1,034	656		
	1907	348	150	3,000	20	413	209	130		
	1908		150	3,000						
	1909		100	2,000						
Coast (Nanaimo, Alberni, Clayoquot, Quatsino, New Westminster and Victoria Divisions).	1906	218,846	50	1,000	10,330	213,521	91,745	58,212		
	1907	84,738	50	1,000	5,334	110,254	70,356	43,663		
	1908	27,831	50	1,000	2,492	51,510	29,598	14,864		
	1909	39,557	50	1,000	6,360	131,461	38,676	18,924		
Miscellaneous (other metals, building stone, brick, etc.)	1906									
	1907									
	1908									
	1909									
TOTALS	1906	1,963,872	47,420	948,400	224,027	4,630,639	2,990,262	1,897,320	52,408,217	2,667,578
	1907	1,804,114	41,460	828,000	196,179	4,055,020	2,745,448	1,703,825	47,738,703	2,291,158
	1908	2,083,606	32,350	647,000	255,582	5,282,880	2,631,389	1,321,483	43,195,733	1,632,799
	1909	2,057,713	23,850	477,000	238,224	4,924,090	2,532,742	1,239,270	44,396,346	1,709,259

METALLIFEROUS MINES, ETC., FOR 1906, 1907, 1908 AND 1909.

COPPER.		TOTALS FOR DIVISIONS.				TOTALS FOR DISTRICTS.			
Pounds.	Value.	1906.	1907.	1908.	1909.	1906.	1907.	1908.	1909.
	$	$	$	$	$	$	$	$	$
						405,400	360,500	405,000	247,000
		355,800							
			306,500						
				355,000					
					220,000				
		39,600							
			44,000						
				30,000					
					12,000				
		10,000							
			10,000						
				20,000					
					15,000				
						555,599	572,809	298,234	234,498
		455,000							
			408,000						
1,014	134			203,179					
4,291	557				200,730				
293,269	56,542	100,599							
674,887	134,977		164,809						
489,859	64,661			95,055					
133,360	17,310				33,768				
						2,964,887	2,327,120	1,483,123	1,327,710
		2,940,744							
			2,321,121						
				1,467,481					
					1,326,585				
6,910	1,332	24,143							
			5,999						
				15,642					
					1,125				
						4,548,253	4,707,870	5,228,224	4,697,249
		267,190							
			364,868						
				342,181					
					572,340				
216,034	41,651	470,631							
434,222	86,845		587,395						
53,243	7,028			392,836					
186,572	24,217				557,455				
		516,128							
2,861	552		573,742						
				676,580					
					554,737				
4,750,110	915,821	3,173,587							
5,080,275	1,016,055		3,049,702						
5,042,244	665,576			3,673,392					
3,509,909	455,586				2,875,084				
1,145	221	120,717							
			132,169						
				143,235					
					137,633				
						20,314	15,721	13,779	16,676
		20,314							
			15,721						
				13,779					
					16,676				
						8,674,710	8,289,288	7,429,824	7,443,046
32,226,782	6,213,323	8,593,469							
31,521,550	6,304,310		8,276,995						
40,178,521	5,303,565			7,425,380					
40,603,042	5,270,275				7,440,046				
		2,624							
2,586	517		1,526						
3,269	432			1,444					
					1,000				
355,377	68,517	78,617							
36,120	7,224		10,767						
				3,000					
					2,000				
						1,263,339	771,533	266,227	301,962
5,138,000	990,606	1,263,339							
3,083,080	616,616		771,533						
1,506,464	198,853			266,227					
1,160,071	150,577				301,962				
						1,000,000	1,200,000	1,370,000	1,600,000
		1,000,000							
			1,200,000						
				1,370,000					
					*1,600,000				
42,990,488	8,288,565	19,432,502				19,432,502			
40,832,720	8,166,544		18,244,847				18,244,847		
47,274,614	6,240,249			16,494,411				16,494,411	
45,597,245	5,918,522				15,868,141				15,868,141

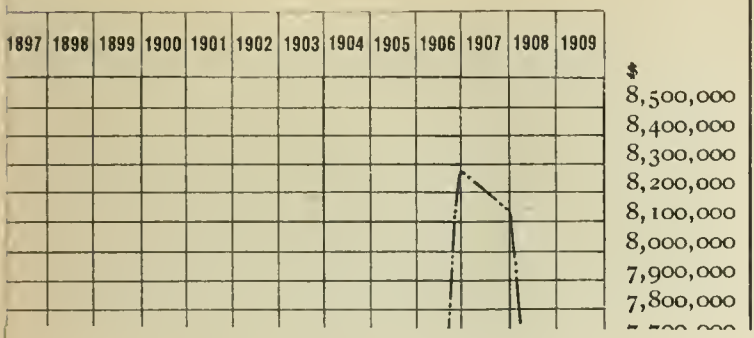
*Including Zinc, $400,000.

TABLE X.

Showing Comparative Production in 1909 of Certain Minerals by British Columbia and Other Provinces of Dominion.

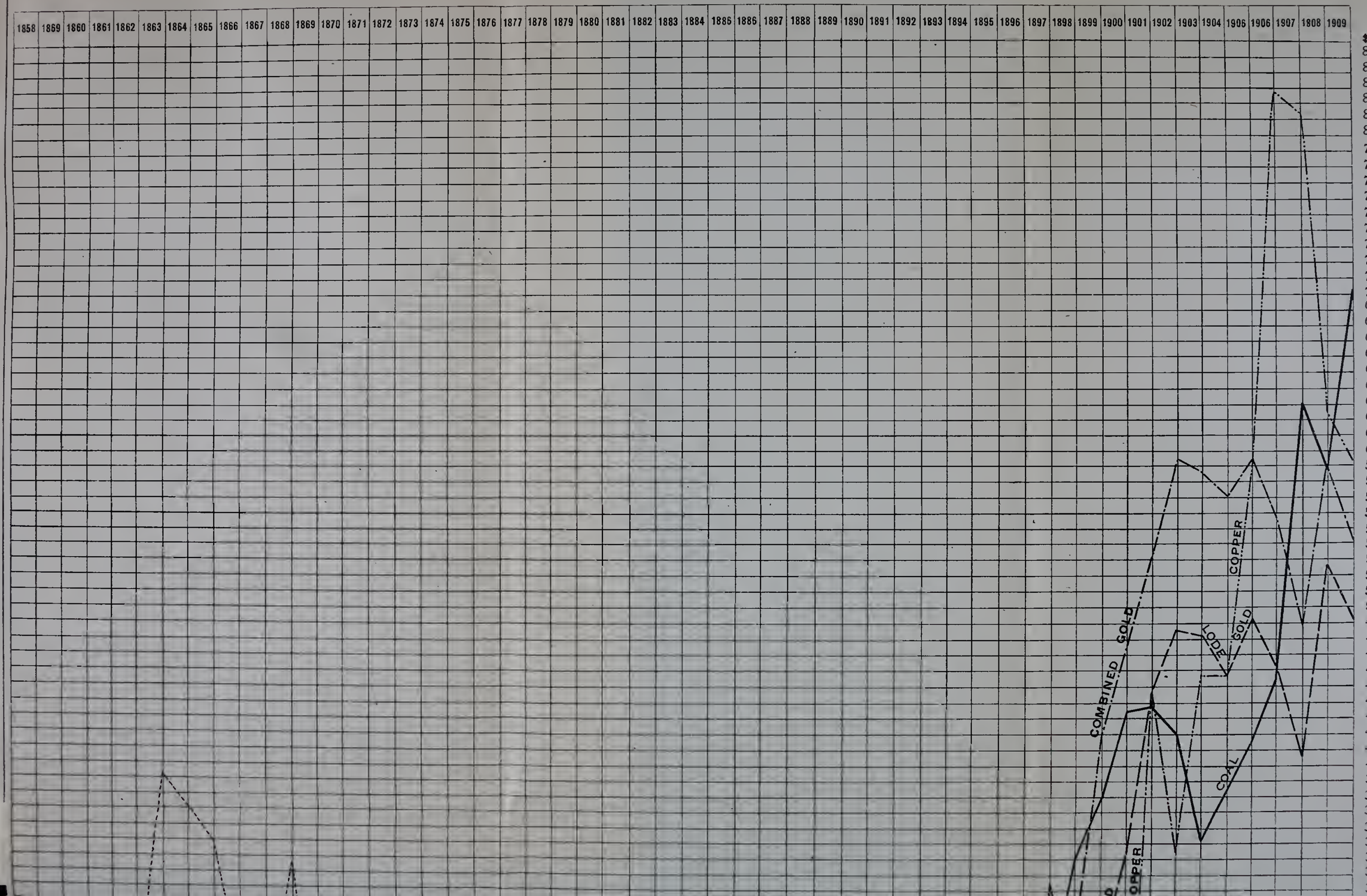
	Aggregate of Provinces.*			
			YUKON TERRITORY.	
Gold	...		$3,960,000	
			BRITISH COLUMBIA.	ALL OTHER PROVINCES COMBINED.
Gold	$5,830,000	$5,401,090		$ 428,910
Silver †	13,640,991	1,239,270		12,401,724
Copper	7,962,444	5,918,522		2,043,922
Lead †	1,709,259	1,709,259		*Nil.*
Iron	2,234,180	*Nil.*		2,234,180
Coal	25,074,972	7,022,666	Coke. Coal.	16,500,033
Coke		1,552,218		
Total	$56,501,849	$22,843,025		$33,653,824

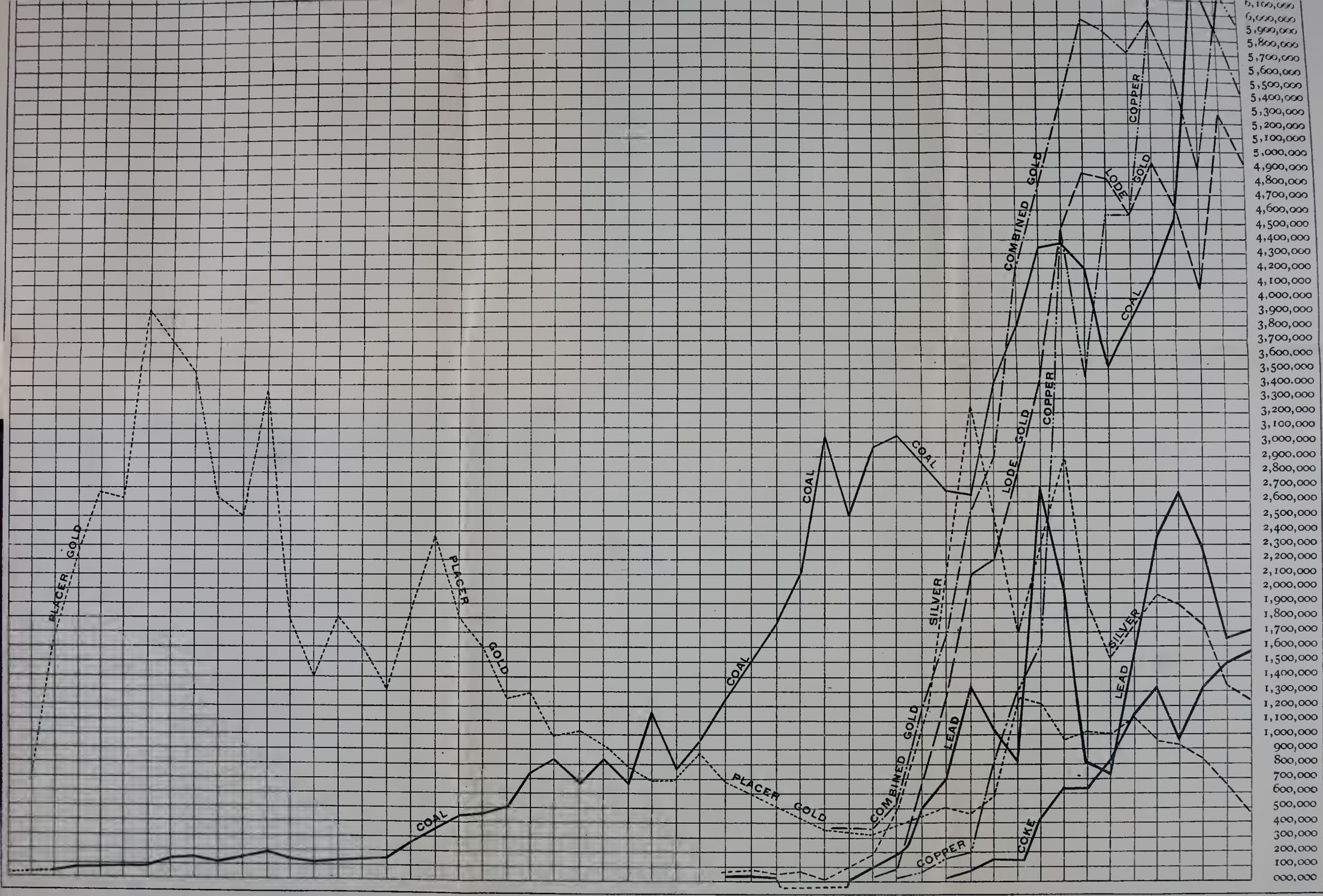
* Taken from "Preliminary Report on the Mineral Production of Canada in 1909," corrected by final figures of British Columbia Statistics.
† At the British Columbia valuation.


1897
1898
1899
1900
1901
1902
1903
1904
1905
1906
1907
1908
1909
$
8,500,000
8,400,000
8,300,000
8,200,000
8,100,000
8,000,000
7,900,000
7,800,000

TABLE

SHOWING MINERAL PRODUCTION OF BRITISH COLUMBIA




PLACER GOLD
COAL
PLACER GOLD
COAL
COAL
COAL
PLACER GOLD
COMBINED GOLD
SILVER
LEAD
COPPER
COKE
COMBINED GOLD
LODE GOLD
COPPER
COAL
LODE GOLD
SILVER
LEAD
6,100,000
6,000,000
5,900,000
5,800,000
5,700,000
5,600,000
5,500,000
5,400,000
5,300,000
5,200,000
5,100,000
5,000,000
4,900,000
4,800,000
4,700,000
4,600,000
4,500,000
4,400,000
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1,400,000
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1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
000,000

PROGRESS OF MINING.

The value of the mineral products of the Province for the year 1909 amounts to $24,443,025, which, while it is less than that of 1906 and 1907, is still considerably greater than that of any previous year.

The tonnage of ore mined in the Province during the year 1909, exclusive of coal, was 2,057,713 tons, a decrease from the preceding year of 25,893 tons, or 1.24 %.

This total tonnage was produced by the various districts in the following proportions:—Boundary, 71.03 %; Rossland, 11.55 %; Fort Steele, 7.28 %; Coast District, 1.92 %; all other districts, 8.22 %.

The number of mines from which shipments were made in 1909 was 89, and of these only 52 shipped more than 100 tons each during the year, while but 32 shipped in excess of 1,000 tons each. Of these latter, 8 were in the Nelson Mining Division, 5 in the Boundary District, 5 in the Ainsworth Division, 4 in the Slocan District, 3 in the Coast District, 3 in the Trail Creek (Rossland) Division, 2 in the Fort Steele Division, 1 in the Trout Lake Division, and 1 in the Queen Charlotte Division.

The following table shows the number of mines which shipped ore during the year 1909; the districts in which they are situated, and the tonnage produced in each district, together with the number of men employed, both above ground and underground:—

TABLE SHOWING DISTRIBUTION OF SHIPPING MINES IN 1909.

	Tons of Ore Shipped.	No. of Mines Shipping.	No. of Mines Shipping over 100 tons in 1909.	Men Employed in these Mines.		
				Below.	Above.	Total.
CASSIAR:						
Atlin, Skeena & Queen Charlotte	4,269	2	1	7	65	72
EAST KOOTENAY:						
Fort Steele	149,680	2	2	232	150	382
Windermere-Golden	20	2	..			
WEST KOOTENAY:						
Ainsworth	97,698	16	6	126	72	198
Nelson	36,814	16	12	196	85	281
Slocan	28,306	22	11	224	84	308
Trail	237,656	7	3	517	160	677
Other Divisions	1,750	4	2	40	16	56
LILLOOET	430	2	2	6	5	11
YALE:						
Boundary	1,461,533	9	8	579	247	826
Ashcroft-Kamloops	.....	.....	.....	.....	.....	.....
Similkameen-Vernon	.....	.....	.....	.....	.....	.....
COAST	39,557	7	5	121	105	226
Total	2,057,713	89	52	2,048	989	3,037

In explanation of the table it should be said that, in its preparation, a mine employing twelve men for four months is credited in the table with four men for twelve months, so that the total given is less than the actual number of individuals who worked in the mines during the year.

The "labour employed to the ton of ore mined" forms some criterion of the total cost of mining in a camp, since the cost of labour is in a more or less constant proportion to such total cost. In this respect it is interesting to note in the various districts the number of tons of ore mined to each man employed.

An analysis of the above table shows, approximately, that, taking the Province as a whole, there were 677 tons of ore mined a year for each man employed about the mines. In this respect, however, the districts vary very materially, since, in the Slocan, the figures show 91 tons mined to the man in the year; in the Nelson District, 131 tons; in Trail Creek District, 351 tons; and in the Boundary, 1,769 tons mined to the man employed.

Such generalisation, of course, does not apply exactly to any one mine, but only to the district, and in the first two districts mentioned the mines vary in character so greatly, some having high-grade shipping ores and others low-grade concentrating ores, that care must be taken not to carry these average figures too far.

TABLE SHOWING NON-PRODUCING MINES AND MEN EMPLOYED.

DISTRICT.	NUMBER OF MINES.			MEN EMPLOYED.		
	Working.	Idle.	Total.	Above.	Below.	Total.
COAST AND CASSIAR	5	12	17	18	30	48
EAST KOOTENAY	3	7	10	10	13	23
SLOCAN	20	45	65	28	58	86
NELSON	6	9	15	3	8	11
TRAIL CREEK	2	7	9	4	3	7
LARDEAU AND TROUT LAKE	3	4	7	5	4	9
BOUNDARY	8	14	22	13	20	33
Total	47	98	145	81	136	217

STATISTICAL TABLES.

Referring to the preceding tables of the mineral production of the Province, the following is a summary of their contents:—

TABLE I. shows the total gross value of each mineral product mined in the Province up to the end of 1909, aggregating $347,820,584. From this table it will be seen that coal-mining has produced more than any other separate class of mining, a total of $102,904,261; followed next in importance by placer gold at $70,673,103, and third by copper at $55,871,893.

The metal gold, obtained from both placer and lode mining, amounts to a value of $125,950,790, the greatest amount derived from any one mineral, the next important being coal, the total gross value of which, combined with that of coke, is $102,904,261, followed by copper at $55,871,893, silver at $29,850,586, and lead at $23,259,255.

Table II. shows the values of the total production of the mines of the Province for each year from 1890 to 1909 (inclusive), during which period the output has increased nearly ten-fold, and has now reached a production, for the past year, valued at $24,443,025, or more than double what it was in 1898. The value of the total products of the mines of the Province up to the end of 1909 is $347,820,584.

TABLE III. presents in graphic form the facts shown in figures in the tables, and demonstrates, to the eye, the rapid growth of lode mining in the Province, and also the fluctuations to which it has been subject.

It will be seen that, although coal-mining has been a constantly increasing industry during this whole period of twenty years, lode mining did not begin, practically, until 1894, since when it has risen with remarkable rapidity, though not without interruption, until it reached, in 1906, the $17,000,000 line, and the total production nearly reached the $26,000,000 line.

TABLE IV. gives the quantities in the customary units of measure, and the values, of the various metals or minerals which go to make up the grand total of the mineral production of the Province, and also, for the purposes of comparison, similar data for the two preceding years.

The table shows that there has been a decrease in the production of placer gold of some $170,000, and at the same time a decrease in the output of lode gold of $358,790, making a total decrease of $528,790 in the production of the metal.

The amount of silver produced this year was 2,532,742 ounces, having a gross value of $1,239,270, a decrease from the preceding year of 98,647 ounces, and in value of $82,213, due chiefly to decreased productions in the Fort Steele, Slocan, and Rossland Districts.

The table shows an output of lead in 1909 amounting to 44,396,346 pounds, valued at $1,709,259, which is an increase over the production of the preceding year of 1,200,613 pounds of lead.

The production of copper this year was 45,597,245 pounds, valued at $5,918,522, a decrease in amount of 1,677,369 pounds, or about 3.5 %. The value of the product was less than that of the preceding year by $321,727—a decrease of 2.1 %.

TABLE V. shows the proportions of the total mineral productions made in each of the various districts into which the Province is divided.

It will be noted that this year, as the two preceding years, the Yale (Boundary) District has the honour of first place on the list. The Coast District comes second, and is followed by West Kootenay District (for many years our greatest producer). East Kootenay takes fourth place. The Coast and East Kootenay Districts owe a considerable percentage of their outputs to the coal-mines situated within their limits, whereas, in the other districts, the production is almost entirely from metal mining.

TABLE VI. gives the statistical record of the placer mines of the Province from 1858 to 1909, and shows a total production of $70,673,103. The output for 1909 was $477,000, a decrease, as compared with the previous year, of about 26.2 %.

TABLE VII. relates entirely to the lode mines of the Province, and shows the quantities and values of the various metals produced each year since the beginning, in 1887, of such mining in the Province. The gross value of the product of these mines to date is $164,259,421. The production in 1909 was $13,791,141, a decrease from the previous year of $686,270, or about 4.7 %.

TABLE VIII. contains the statistics of production of the coal-mines of the Province. The total amount of coal mined to the end of 1909 is 29,629,025 tons (of 2,240 lbs.), worth $92,010,796. Of this, there was produced in 1909 some 2,006,476 tons, valued at $7,022,666. In these figures of coal production, the coal used in making coke is not included, as such coal is accounted for in the figures of output of coke. The amount of coal used in making coke was 394,124 tons, from which was made 258,703 tons of coke, having a value of $1,552,218, an increase over the preceding year of 11,304 tons, or 4.5 %, with an increase in value of $67,824. While 258,703 tons of coke were actually made, only 251,504 were sold; 7,199 tons being added to stocks at the mines.

The average selling prices taken this year in the calculation of value of product are the same as those used last year; that for coal being $3.50 and for coke $6 per ton of 2,240 lbs. The prices used in calculations prior to 1907 were $3 and $5, respectively.

More detailed statistics as to the coal production of the Province and of the separate districts are given elsewhere in this Report.

TABLE IX. gives the details of production of the mines of the Province (excepting coal mines) for the years 1906, 1907, 1908, and 1909, and the districts in which such productions were made, showing the tonnage of ore mined in each district, with its metallic contents and its market value.

The total tonnage of ore mined in the Province during the year 1909 was 2,057,713 tons, having a gross value, including building materials, of $15,868,141.

The following table shows the percentages of such tonnage and values derived from the various districts of the Province :—

Yale (Boundary) District	71.03	per cent.	of tonnage and	53.92	per cent.	of value.
Trail Creek M. D.	11.55	"	"	20.84	"	"
Fort Steele M. D.....	7.28	"	"	9.65	"	"
Slocan District.....	1.37	"	"	4.02	"	"
Coast District.....	1.92	"	"	2.18	"	"
Other Divisions.....	6.85	"	"	9.39	"	"
	100			100		

TABLE X. compares graphically the output of mineral products in British Columbia with that of similar products in all the other Provinces of the Dominion, and shows that in 1909 British Columbia produced in the minerals shown an amount equal to over 67.8 per cent. of all the other Canadian Provinces combined.

COAL.

The coal production of British Columbia in 1909 was chiefly mined by three companies—the Wellington Colliery Co. and the Western Fuel Co. on Vancouver Island, and the Crow's Nest Pass Coal Co. in East Kootenay—these companies producing about 88 % of the total coal mined.

Of the smaller collieries of the Coast District, the Pacific Coast Coal Mines, at South Wellington and Suquash, V. I., mined about 70,000 tons of coal, and the Nicola Valley C. & C. Co. about 62,210 tons, while the Vancouver-Nanaimo produced about 10,000 tons, and the Diamond Vale Co. about 1,700 tons.

In the East Kootenay field, the Hosmer and Corbin Collieries each produced about 60,000 tons of coal during the year; neither of these collieries is as yet in full operation.

A new colliery was opened at Princeton, in the Nicola Valley District, by the Vermilion Forks M. & D. Co., during the last month of the year, and shipped a few tons of lignitic coal.

The Pacific Coast Coal Co., as well as equipping its South Wellington Colliery with direct railway connection with salt water and a shipping port, has opened up a new colliery at Suquash, from which it has already mined about 2,000 tons of coal.

The old Gilfillan Colliery at Nanaimo is now being operated by Henry Biggs—an individual—who is producing coal in a small way.

About 60 % of the gross coal output of the Province was mined in the Coast District, and about 72 % of the coal, sold as such, was from that district.

Of coke, however, the Coast District only produced about 5 % of the total amount made during the year, and of this over half was added to stock.

The gross output of the coal mines of the Province for the year 1909 was 2,400,600 tons (of 2,240 lbs.), of which 5,782 tons were added to stock, making coal disposed of 2,394,818 tons. Of this gross amount, 998,494 tons were sold for consumption in Canada, 678,137 tons were exported to the United States, and 63,509 tons were exported to other countries, making the total amount of coal sold 1,740,140 tons.

In addition to the sales, there was used in making coke 394,124 tons of coal, while 260,554 tons were consumed under colliery boilers, etc. From the 394,124 tons of coal were produced 258,703 tons of coke, of which amount 7,199 tons were added to stock and 142 tons were used under colliery boilers, leaving the net coke sales of 251,362 tons. Of this amount, 210,884 tons were sold for consumption in Canada, while the remainder, 40,478 tons, was exported to the United States.

The following table indicates the markets in which the coal and coke output of the Province was sold :—

Coal.	Coast District.	Crow's Nest Pass District.	Total for Province.
Sold for consumption in Canada.....(Tons—2,240 lbs)	862,088	136,406	998,494
" export to United States..... "	324,748	353,389	678,137
" export to other countries..... "	63,509	.....	63,509
Total for District....	1,250,345	489,795	1,740,140
Coke.			
Sold for consumption in Canada.....(Tons—2,240 lbs)	5,493	205,391	210,884
" export to United States..... "	.....	40,478	40,478
" export to other countries..... "	.....	.....	.....
Total for District....	5,493	245,869	251,362

Coast Collieries.

The coast collieries mined in 1909 1,476,735 tons of coal, of which 5,346 tons were added to stock, making 1,471,389 tons distributed from these collieries in 1909. This amount was distributed thus :—

Sold as coal in Canada	862,088 tons.	
" United States	324,748 "	
" other countries	63,509 "	
Total sold as coal		1,250,345 tons.
Used under companies' boilers, etc		192,384 "
Used in making coke		28,660 "
		1,471,389 "

The total coal sales of the coast collieries for the year show, as compared with the sales of the previous year, an increase of 202,053 tons, equivalent to 19.3 %.

The consumption of coal in that portion of British Columbia served by the coast collieries shows in 1909 an increase of 44,124 tons, equal to 6.1 % over the preceding year, while the amount sold for export to countries other than the United States also shows an increase of 33,626 tons, equal to 112.5 %. Export sales to the United States in 1909 show an increase of 24,303 tons, or 8.08 %. The smaller sales in 1908 were attributable to the California oil-fuel competition and imported Oriental coal.

The production of coke in the Coast District in 1909 was confined to the one company producing the article, and amounted to 13,686 tons, of which, however, only 5,493 tons were sold. This was entirely disposed of in Canada. The remainder, 8,193 tons, was added to stock. These figures show an increase in the coast output of coke, as compared with 1908, of 1,156 tons, or 9.70%. The coke export to the United States from the Coast District in 1908 was 3,118 tons, but in 1909 there were no exports at all. The reason for this is that the smelting plants formerly operating on Prince of Wales Island, Alaska, have since been shut down.

In the Coast District, among the newer collieries that are beginning to make an appreciable output may be mentioned the Nicola Valley Coal & Coke Co., which shipped in 1909 some 62,210 tons of coal, and this production was limited by the market which the C. P. R. freight rates would allow it to reach, rather than by the capacity of the mines. Adjoining this colliery is the Diamond Vale Colliery Co.'s property, which, though still in a state of development, mined in 1909 some 1,700 tons of coal.

Vermilion Forks Mining & Development Co., of Princeton, mined 150 tons of coal in 1909.

On Vancouver Island, the Pacific Coast Coal Mines, Ltd., mined at South Wellington, a few miles south of Nanaimo, some 69,055 tons of coal. Railway and bunkers have been built at Boat harbour.

Gilfillan Colliery shut down; Henry Biggs, as an individual, produced 1,236 tons of coal from the property.

East Kootenay Coalfield.

The annual returns of the eastern slope, or Alberta side, of the Rocky Mountains are made to the Government of that Province, whence they may be obtained by any one interested. Three companies were operating on the British Columbia side in 1909, viz.: The Crow's Nest Pass Coal Co., Hosmer Mines, Ltd., and the Corbin Coal & Coke Co., Ltd. The details of their several operations are given elsewhere, together with particulars of other properties at present under development. A description of this coalfield, by the Provincial Mineralogist, is given in this Report, under the heading of "Coal Mining."

By far the greatest proportion of coal is produced by the Crow's Nest Pass Coal Co., operating collieries at Michel, Coal Creek (Fernie), and Carbonado, the united gross output of which, in 1909, was 802,717 tons. Of this output, 330,189 tons were used in making coke. The resulting coke amounted to 223,442 tons. Hosmer Mines produced 60,324 tons of coal and 21,575 tons of coke. Corbin Coal Co. produced 60,824 tons of coal and no coke.

The collieries in the East Kootenay District made in 1909 a gross production of 923,865 tons of coal, of which 436 tons were added to stock during the year, leaving the amount of coal distributed 923,429 tons. Of this amount, 365,464 tons were used for making coke, the resulting coke being 245,017 tons.

The following table shows the disposition made of the coal output of this district:—

Sold as coal in Canada	136,406 tons.	
" United States	353,389 "	
Total sold as coal		489,795
Used by the company in making coke		365,464
" " under boilers		68,170
		923,429 tons.

The amount of coke actually produced in 1909 was 245,017 tons. Of this, 142 tons were used under boilers, and the remainder, 244,875 tons, together with 994 tons taken from stock, was sold, making total coke sales for the year 245,869 tons.

As compared with the previous year, the coke production of 1909 shows an increase of 10,148 tons, or 4.3 %. Total coke sales show an increase of 5,260 tons, or 2.2 %. Coke sales in Canada show an increase of 1,022 tons, or 0.49 %. Coke sales to the United States show an increase of 6,282 tons, or 18.4 %.

GOLD.

Placer Gold.

The production of placer gold during the past year was about $477,000, as nearly as can be ascertained, which is $170,000 less than was produced in 1908, being a decrease of 26 %. Placer mining is entirely dependent upon the water supply, which in turn depends upon the snowfall of the previous winter and the character of the spring weather—variables upon which it is impossible to forecast—and the conditions this past season have not been favourable.

There is no question but what, in the known placer camps of the Province, most of the more easily available deposits have been worked out, leaving only those the operation of which called for greater capital and plant, with greater attendant risks and less security of immediate profits.

In the Atlin District the Atlin Consolidated Mining Co.'s plant was again idle this past season, being under process of alteration to a design dictated by experience obtained.

The Pine Creek Power Co. (Ruffner's holdings) was unfortunate in that the dam, constructed at the outlet of Surprise lake to conserve the water for the season's supply, broke, and not only was the water lost, but much damage was caused to the plant by the sudden flood. The dam has been replaced by a more substantial structure, and it is expected that the satisfactory returns looked for last season will only have been deferred until 1910.

McKee creek is now entirely controlled by one company, and while a very fair return was obtained this year, there is good reason to hope for better in the future.

In the Dease Lake District, the Berry Creek Co. again failed to do any further work, and very little gold was obtained in that section of the Province.

In the Omineca District, the excitement of the previous season over placer-gold finds on the Ingenika river and McConnell creek proved to be without foundation, and no product was obtained from these. In the Manson Creek section, one of the mines produced about $10,000 worth of gold, but the other properties were not successful.

In the Cariboo District, none of the deep-drifting enterprises have made a success and all are practically at a standstill. A concentration of various interests into larger companies, with the consequent concentration of water rights, has enabled better plants to be installed, and although there is a small output this year, the larger plants are almost ready for work and should prove their utility during the coming season.

In the Quesnel Division, the plant at Bullion has been idle, but J. B. Hobson is putting in a new plant in the Spanish lake direction, while H. W. DuBois is establishing a very extensive hydraulic plant at 20-Mile creek, on Quesnel river, the water for the operation of which is being brought over from Swift river. It is not probable that either of these plants will be producing gold until 1911.

Gold from Lode Mining.

The value of gold produced from lode mining in the Province during the year 1909 was $4,924,090, a decrease, as compared with previous year, of $358,790, or 6.75 %. This decrease is due to a reduced tonnage and output in the Rossland camp, which is only partly compensated for by increased production in the Nelson, Boundary, and Coast Districts. The greatest increase in output has been in the Nelson District, where the output this year is nearly $100,000 greater than during the preceding year, and is now 50 % greater than it was in 1907. There was also an increased gold production in the Coast District, amounting to about $80,000 greater than the preceding year, due to a renewal of mining on Texada island. The Boundary District made an increase of $35,000 in its gold output this year, despite the fact that the tonnage of ore mined in the district was lower than last year. About 86.5 % of the lode-gold output of the Province was recovered from the smelting of copper-bearing ores; the remaining 13.5 % was obtained from stamp milling, etc.

The only large stamp mill in operation is at the *Nickel Plate* mine, at Hedley, in the Osoyoos Mining Division, which milled some 31,000 tons of ore, and produced from amalgamation, concentrates, and cyaniding some 16,200 ounces of gold. A couple of small stamps were at work in the Sheep Creek camp, of Nelson Mining Division, working an exceptionally rich ore.

SILVER.

The total amount of silver produced in the Province during the year 1909 was 2,532,742 ounces, valued at $1,239,270, a decrease in amount, as compared with the previous year, of 98,647 ounces and in value of $82,213; about 98.2 % of the total silver was produced from ores in which it was found associated with lead, the remainder being obtained from copper-silver ores.

The Slocan District—including the Ainsworth, Slocan, Slocan City, and Trout Lake Mining Divisions—produced about 50 % of the total Provincial output of silver this year, and the Fort Steele Mining Division about 23 %, all from argentiferous galenas.

LEAD.

The lead production of the Province for the year 1909 was 44,396,346 lbs. of lead, having a market value of $1,709,259, showing, as compared with the previous year, an increase in amount of 1,200,613 lbs. of lead, or 2.8 %, and an increase in value of $76,460, or 4.7 %.

The average market price of this metal for the year 1909 was a little higher than for the previous year.

The lead production is this year, as usual, derived chiefly from the Fort Steele Mining Division, as is shown in the following table:—

Fort Steele M. D. produced	27,023,252 lbs. lead	= 60.86 %	of total.
Ainsworth "	10,298,343 "	23.19	"
Slocan "	4,976,199 "	11.20	"
Nelson "	1,097,069 "	2.47	"
Trout Lake "	976,601 "	2.23	"
All others	24,882 "	.05	"
	44,396,346	100.00	

COPPER.

The amount of copper in ores mined in the Province in 1909, and smelted during the year, was 45,597,245 lbs. fine copper, valued at the average New York market price for copper at $5,918,522. These figures do not take into account smelter charges or deductions.

As compared with the preceding year, there is, therefore, a decreased production in amount of 1,677,369 lbs., and in value of $321,727. There is a slight increase in the Boundary District and in the Nelson Mining Division, with a heavy falling off in the Rossland Mining Division and in the Coast Districts.

The following table shows the production of the various districts for the years 1907, 1908 and 1909:—

	1907.	1908.	1909.	
Yale (Boundary) District	31,521,550 lbs.	40,181,790 lbs.	40,603,042 lbs.	= 89.04 %
Rossland "	5,080,275 "	5,042,244 "	3,509,909 "	7.70 "
Coast & Cassiar "	3,757,967 "	1,997,337 "	1,297,722 "	2.84 "
Yale-Kamloops "	36,120 "	.....	.....	.....
Nelson "	434,222 "	53,243 "	186,572 "	0.42 "
Other Districts.....	2,586 "	.....	.....	.....
	40,832,720 "	47,274,614 "	45,597,245 "	100.00 "

The average assays of the copper ores of the various camps, based upon the copper recovered, were as follows:—

Boundary, 1.41 %; Coast, 1.5 %; and Rossland, 0.75 %.

OTHER MINERALS.

Iron Ore. There has been no iron ore mined in the Province this past year, other than that necessarily mined in development work, and none of this has been shipped, the reason being that there is no iron blast-furnace in operation within the district, and, consequently, no market for iron ore.

Zinc Ore. There has been a comparatively small quantity of zinc ore produced this past year, although the industry has not been neglected. The total amount of zinc ore and concentrates produced and sold during the year was about 10,000 tons, ranging from 38 to 48 % zinc. The only distinctly zinc-mining in the Province is at the *Lucky Jim*, in the Slocan Mining Division, where about 4,700 tons of 48 % zinc ore was produced.

In the Ainsworth Mining Division the *Whitewater* produced about 1,600 tons of 38 % zinc concentrates, from an ore consisting of mixed galena and zinc blende, and the *Whitewater Deep* produced about 3,000 tons of 43 % zinc concentrates from a similar ore. The zinc concentrates from both these mines carried an appreciable amount of silver, ranging from 15 to 25 ounces to the ton.

The *Monitor and Ajax* made small shipments of concentrates rather low in zinc, amounting to 325 tons.

Other properties produced zinc concentrates, but they were not sold this year in time to enter into this year's figures; among these is the Canadian Metal Co.'s plant at Riondel, where the concentrates produced were between 35 and 40 % zinc. The price offering for this grade of concentrates was so small as to leave little margin of profit, so the management is experimenting with a process for making zinc oxide, for which a better price can be obtained.

The Canadian Zinc Co.'s electro-thermic smelting plant at Nelson has remained idle, but there is a chance that this coming year renewed experiments may be tried to perfect the process.

Platinum. While platinum is found in many of the alluvial-gold workings, where it can be saved as a by-product, the saving of it in a small way is attended with so much trouble that it has been practically neglected and no appreciable production made.

Building Stone. Excellent building stone of various sorts is found in abundance in almost every part of the Province, but the fact of its widespread distribution has, however, been somewhat against the establishment of large quarrying industries, as a sufficient local supply could always be obtained, and, except within reach of the larger cities, few regularly equipped quarries have been opened.

On the Coast, chiefly between Vancouver island and the Mainland, there are several well-equipped quarries taking out granite, sandstone, and andesite, all of excellent quality. These quarries supply the stone building material of the Coast cities, and also export to the United States.

A detailed description of the more important quarries was given in a previous report of this Bureau.

Marble. In the interior of the Province, the Canadian Marble & Granite Company opened a marble quarry on the line of the Lardo-Trout Lake Railway, about eight miles from Lardo, and took during 1909 block marble which, when sawed into slabs, amounted to some $30,000 in value. This company formerly shipped the rough blocks of the marble which were elsewhere sawn into slabs, etc., but during the past year the company has been busily engaged in erecting at the quarries large and well-equipped dressing-works, so that by next season the marble will leave the works in the finished state. During this period of construction the product shipped from the quarry has been comparatively small.

The Nootka Marble Quarries, on Nootka sound, on west coast of Vancouver island, that were opened up last season, have not made any very important shipments, and information as presented by the Report of Directors indicates that some $3,000 worth of marble is on hand at the quarry, but does not show that any sales were made. The mine and quarry have not been operated since July, 1909.

Red Brick. The demand for brick is rapidly increasing with the growth of cities, in which fire-proof building construction is demanded, but the manufacture does not seem to have kept pace with the demand, as large importations of brick have been made from Puget sound points. A special report by the Provincial Assayer, published in last year's Report, shows that there are unlimited clay deposits available, but that the brick-yards of the Province are for the most part worked on rather primitive lines, and that the price of even the cheapest class of red brick is such as to invite serious competition from concrete in building operations. The actual figures of production cannot be obtained from the manufacturers for publication, but, as nearly as can be estimated, the number of red brick produced in the Province during the past year was about 40,000 M.

Fire-brick and Fire-clay. The fire-brick plant at Comox has not been in operation. The Vancouver Fire-clay Co.'s plant at Clayburn has been somewhat remodelled, and is now producing a brick of much higher class and of more uniform grade. The deposits consist of clays of various qualities—described in last year's Report—and the product varies from a superior quality of common or building brick up to a good quality fire-brick and fire-tile.

GRANITE-CRUSHING PLANT, BURRARD INLET, NEAR VANCOUVER.

Pottery and Drain Pipe.

The B. C. Pottery Works at Victoria West derives its supply of fire-clay from the coal-mines of the Wellington Colliery Co., and manufactures drain and sewer pipe, chimney tiles, etc., the sales for the year being estimated at considerably over $100,000.

Lime.

The manufacture of lime is conducted in a small way at a large number of points in the Province, but only on the Coast has any attempt been made at more extensive operations. In the neighbourhood of Victoria, on Esquimalt harbour, Raymond & Sons have three kilns in operation, and there are kilns on Saanich inlet. On Texada island—in addition to the old plant at Marble bay—a new and extensive plant is being erected at Blubber bay. The limestone being used is of exceptional purity, but in some instances the limestone beds are cut by igneous dykes which have to be rejected and this somewhat increases the costs of quarrying.

Portland Cement.

The only company manufacturing cement in the Province is the Vancouver Portland Cement Co., with works at Tod inlet, on the Saanich arm, about twelve miles from Victoria. The capacity of these works at present is about 300,000 barrels a year, and this past year the company manufactured about 238,000 barrels of cement, valued in the neighbourhood of $360,000. The raw materials, limestone and clay, are quarried on the company's property adjoining the works.

Petroleum and Oil Shales.

In the Flathead valley of East Kootenay, where seepages of oil occur and where a great number of locations of oil claims have been taken up, no serious attempt has as yet been made to prove the value of the claims, and the district is no further advanced than it was four years ago.

In the vicinity of Sooke, Vancouver Island, some oil locations have been made, but have yet to be proved of value.

Nothing further has been heard of the oil-bearing shale deposits in the vicinity of Harper's Camp—to develop which a company was formed in Vancouver—and no further development has taken place on the property.

A deposit of oil shales has been found on the North Thompson river, which carries a fair percentage of oil, and it is probable that in the near future serious attempts will be made to prove the value of the deposits from a commercial point of view.

Crushed Rock and Gravel.

Concrete construction has become so extensive on the Coast that companies have been formed to supply suitable material for such work. Near the entrance to Vancouver harbour a company has opened up a quarry in a granite rock, and has erected a crushing and sizing plant and bins for the manufacture of crushed rock for concrete-making and for road-making in Vancouver. Near Victoria, two or three gravel companies have been formed for supplying washed sand and gravel, properly screened to size; at least one of those companies has installed a system of mining the gravel by hydraulic streams and carrying the product to the screens by the water.

BUREAU OF MINES.

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Work of the Year.

The work of the Bureau of Mines increases, of necessity, year by year, and this growing activity is due to the following causes: the extension of the mining area of the Province, with the proportional increase in the number of mines; the increasing desire of the outside public for the free information which the Bureau supplies with regard to the various mining districts and camps, and the appreciation by the prospector of the fact that he may obtain, gratis, a determination of any rock or mineral which he may send to the Bureau.

The routine work of the office, and the preparation and publication of the Report for the year just ended, followed by the examination in the field of as many of the mines and mining districts as the season would permit, together with the work of the Laboratory and instruction of students, fully occupied the staff for the year. The staff of the Bureau consists of the Provincial Mineralogist, the Provincial Assayer, and a junior assistant in the Laboratory, with a clerk as temporary assistant during the publication of the Report.

Provincial Mineralogist.

After the Report for the preceding year had been issued, the Provincial Mineralogist, with assistants, held an examination at Victoria of candidates for Certificates of Competency as Assayers, which lasted a week, after which he was fully occupied with necessary office work until the season was sufficiently advanced for field-work.

The spring was unusually late on the Coast, but in the latter part of June the Provincial Mineralogist, accompanied by Mr. Harold Nation as an assistant, left Victoria for the Queen Charlotte islands, taking advantage of the offer of transportation in a steamer specially chartered by the Messrs. Phipps, of New York, thereby saving a week's time.

Arriving at Skidegate, a gasolene launch was engaged and a visit made to the west coast of Moresby island, where certain prospects which had attracted some notice were visited. The trip was continued around the south end of the island to the vicinity of Ikeda bay and Jedway, and the properties there examined. At Ikeda bay, acting as an Inspector of Mines, the Provincial Mineralogist made an investigation into the circumstances connected with the death in the mine of Jos. Marco, the former manager. On July 4th Lockeport was reached, where the *Swede* group was visited.

Skidegate was again reached on the 5th and Prince Rupert on the 7th, a return being made to Victoria on July 12th.

From July 16th to 21st the Provincial Mineralogist was engaged at the A. Y. P. Exposition in giving some assistance as to the mineral exhibit from British Columbia, and investigating the general mining exhibit and apparatus for rescue-work in coal-mines.

On July 28th the Provincial Mineralogist, accompanied by Mr. Nation, left Victoria and proceeded to Fernie, where he met the Chief Inspector of Mines, and with him went over a number of the collieries of that district.

On August 4th, the Chief Inspector having left for the Coast, the Provincial Mineralogist started from Michel for a trip to the upper portion of the Elk river, to examine the development work which had been done in that section towards the opening-up of a new and

wonderfully extensive coalfield. In this examination he was greatly assisted by Mr. Thorne, Chief Engineer of the Canadian Pacific Railway's coal interests in British Columbia, who had been sent to accompany the writer, through the courtesy of Mr. Aldridge, the general manager of the company's operations; this company has done the most to open up and prove the new field. After examining the development of the Canadian Pacific Railway Syndicate's, the Northern Coal & Coke Company's on Elk River, and the Imperial Coal & Coke Company's properties on Fording river, a return was made to Michel on August 12th, the trip having been made partly by waggon, pack-train, and on foot.

On August 14th, Saturday, the Provincial Mineralogist and assistant arrived in Cranbrook, and on Monday, 15th, proceeded to Moyie, staying there until the 18th, making an examination of the lead-silver mines in that vicinity.

August 19th, 20th, and 21st were spent in the Kimberley camp, examining the mines of that camp and the smelter at Marysville.

On Monday, August 23rd, a team was secured at Cranbrook and a start made by waggon for Windermere *via* Fort Steele, Wasa, and Canal Flats, arriving there on the evening of the 26th, and at Athelmer on the 27th.

On the 28th Mr. C. Cartwright, of Athelmer, kindly undertook to run the Provincial Mineralogist and assistant down the Columbia river in his gasolene canoe, to Spillamachene where Capt. F. Armstrong, manager of the *Giant* mine, was met by appointment. Here saddle-horses were obtained and, after a ride of seven miles, the *Giant* mine was reached that evening; early next morning the mine was examined, then, as the saddle-horses had escaped and returned alone, the distance back to Spillamachene had to be walked before noon in order to catch the steamer "Isabel," bound for Golden.

Golden was reached that night, and the next day, August 30th, the Canadian Pacific Railway train was taken to Field, arriving there about 5 P.M. After a walk of a couple of miles up the railroad track to the eastward, the *Monarch* mine was reached, and the work in progress there having been examined, the return to Field was made that evening.

On August 31st the train was taken back to Golden, samples were packed and sent to Victoria by express, and mail was attended to, after which, at 5 P.M., the steamer bound up the Columbia river was boarded; the steamer tying up after dark at Spillamachene.

On September 1st the steamer was left at 8 A.M. at Botts' landing, where Thomas Brown, one of the owners of the *Lead Queen* mineral claim, met the Provincial Mineralogist with saddle-horses, and, after a ride of twenty miles by pack-train, Brown's cabin, at the foot of the mountain on which the *Lead Queen* is situated, was reached, and the night spent there.

September 2nd. After a climb of 3,000 feet, the claims were reached and examined, and the return made to the cabin by the afternoon. When the horses were finally corralled, a ride of twelve miles was made to James Hearst's ranch, where the party was very comfortably put up in a tent for the night.

September 3rd. A drive of all day in a waggon, stopping at noon for lunch at Foster's ranch, brought the party to Wilmer, where the night was spent.

On September 4th Mr. R. R. Bruce drove the writer over the newly laid-out irrigation lands and experimental orchard and farm on the west side of Windermere lake, and then on to Athelmer.

On September 5th, a pack-train having been gathered together in advance by Mr. Charles Cartwright, the Provincial Mineralogist, and Mr. Nation, with a packer, left Athelmer to inspect some of the mining properties on the north fork of Toby creek, the trip being continued

over into West Kootenay by way of the wonderfully picturesque Earl Grey pass and Hamill creek. Argenta, at the north end of Kootenay lake, was reached at noon on September 11th; here a row-boat was taken to Lardo, where a gasolene launch was obtained, and the town of Kaslo reached that same night.

On Sunday, September 12th, plans were arranged with the Gold Commissioner of the district, Mr. Chipman, for a trip up the Duncan river, to start the following Wednesday.

Monday and Tuesday, September 13th and 14th, were spent in Nelson, where some 100 letters were found waiting and had to be answered.

On September 15th a return was made to Kaslo, where supplies, etc., were obtained, and the evening boat taken to Lardo, connection being made there with train for Howser, on Duncan lake, which was reached at midnight.

On September 16th a couple of canoes were obtained, and the party paddled and poled up the Duncan lake and river to the head of canoe navigation, at Healey's ranch. Horses were obtained at Healey's, and a trip made up the Duncan river and to the head of Hall creek, where the *Wagner*, *Bannockburn*, and *Red Elephant* groups of claims were inspected, returning to Healey's on the evening of the 21st, and the next day the trip was made down the river by canoe to Howser, to Lardo by train, and to Kaslo by steamer.

On September 23rd a run was made to Nelson in the morning and back in the afternoon to the *Blue Bell* mine at Riondel, where the night and next forenoon were spent in examining the mine and concentrator, returning to Nelson next afternoon.

On September 25th the Provincial Mineralogist attended the regular meeting of the Western Branch of the Canadian Mining Institute at Nelson, which, after one session, was adjourned to hold a joint meeting with the American Institute of Mining Engineers at Spokane on September 27th, 28th, and 29th, after attending which, return was made to Nelson on September 30th. Saturday, Sunday, and Monday, October 2nd, 3rd, and 4th, were spent at Hamill creek.

October 6th, 7th, and 8th were spent at Sheep Creek camp, in the Ymir District, examining the newly developed gold-mines of that district.

On October 9th the Provincial Mineralogist left Nelson and arrived in Victoria on the afternoon of the 11th.

On October 12th the Provincial Mineralogist left for Nanaimo to make an examination of the Extension colliery, where an explosion had occurred the previous week, after which he appeared at the Coroner's inquest at Ladysmith, returning to the office at Victoria on October 25th.

ASSAY OFFICE.

The following is a summary of the work of the Assay Office of the Bureau for the year 1909, as reported by the Provincial Assayer, Mr. Herbert Carmichael:—

During the year 1909 there were made by the staff in the Government Assay Office 1,830 assays or quantitative determinations, which is nearly double the number made during the previous year; of these, a number were for the Bureau of Mines, or for the Department, for which no fees were received. The fees collected by the office were as follows:—

Fees from assays	$ 333 00
" melting and assaying gold dust and bullion	106 00
" assayers' examinations	210 00
Total cash receipts	$ 649 00
Determinations and examinations made for other Government Departments for which no fees were collected	450 00
Value of assaying done	$ 1,099 00

The value of gold melted during the year was $22,860, in 63 lots, as against $45,255 in 78 lots in 1908.

Free Determinations.

In addition to the above quantitative work, a large number of qualitative determinations, or tests, were made in connection with the identification and classification of rocks or minerals sent to the Bureau for a report; of these no count was kept, nor were any fees charged, as it is the established custom of the Bureau to examine and test qualitatively, without charge, samples of minerals sent in from any part of the Province, and to give a report on the same. This has been done for the purpose of encouraging the search for new or rare minerals and ores, and to assist prospectors and others in the discovery of new mining districts, by enabling them to have determined, free of cost, the nature and probable value of any rock they may find. In making these free determinations, the Bureau asks that the locality from which the sample was obtained be given by the sender, so that the distribution of mineral over the Province may be put on record.

A considerable number of clays were tested during the year; all were found to be of recent glacial origin.

A larger amount of photographic work than usual was done, and an album of photographs for the Agent-General's office is being compiled.

EXAMINATIONS FOR ASSAYERS.

REPORT OF HERBERT CARMICHAEL, SECRETARY OF BOARD OF EXAMINERS.

I have the honour, as Secretary, to submit the Annual Report of the Board of Examiners for Certificates of Competency and Licence to Practise Assaying in British Columbia, as established under the "Bureau of Mines Act Amendment Act, 1899."

The Act requires that at least two examinations shall be held each year, and such have duly taken place.

Both these examinations were held in the Government Laboratory at Victoria, each occupying a week; the first examination began on May 31st, and the second on December 6th, 1909.

At the first examination the Board consisted of the Provincial Mineralogist, the Provincial Assayer, and Mr. D. E. Whittaker, Assistant Assayer. At this examination four candidates came up for examination, and all passed the required examination. At the December examination the Board consisted of the Provincial Mineralogist, the Provincial Assayer, and Mr. D. E. Whittaker, the Assistant Assayer, at which two candidates stood for examination and one successfully passed.

In addition to the five candidates mentioned above who successfully passed the examinations, the Board recommended during the year the granting of four certificates by exemption, under subsection (2) of section 2 of the Act. In accordance with these recommendations, all these nine certificates have been duly issued by the Honourable the Minister of Mines.

The following is a list, up to December 31st, 1909, of those to whom Certificates of Competency have been issued :—

LIST OF ASSAYERS HOLDING PROVINCIAL CERTIFICATES OF EFFICIENCY UNDER THE "BUREAU OF MINES ACT AMENDMENT ACT, 1899."

(Only the holders of such certificates may practise assaying in British Columbia.)

Under section 2, subsection (1).

Austin, John W.....Prince Rupert.
Baker, C. S. H.....Greenwood.
Barke, A. C.....Greenwood.
Belt, Sam'l Erwin.....Greenwood.
Bernard, Pierre.....Monte Christo, Wash.
Bishop, Walter.....Grand Forks.
Buchanan, James.....Trail.
Campbell, Colin.....New Denver.
Carmichael, Norman.....Clifton, Arizona.
Church, George B.....
Cobeldick, W. M.....Scotland.
Collinson, H.....Stewart.
Comrie, George H.....Vancouver.
Crerar, George.....
Cruickshank, G.....Moyie.
Day, Athelstan.....Dawson.
Dedolph, Ed.....Nelson.
Doekrill, Walter R.....Chemainus.
Dunn, G. W.....Rossland.
Farquhar, J. B.....Vancouver.
Fingland, John J.....Salmo.
Grosvenor, F. E.....Riondel.
Hannay, W. H.....Fife.
Hart, P. E.....
Hawkins, Francis.....Silverton.
Hook, A. Harry.....Greenwood.
Hurter, C. S.....
Irwin, Geo. E.....Vancouver.
John, D.....Haileybury, Ontario.
Kiddie, Geo. R.....Jedway.
Kitto, Geoffrey B.....Ladysmith.
Lang, J. G.....
Langley, A. S.....Britannia Beach.
Ley, Richard N.....
Lindsay, W. W.....Rossland.
Longworth, F. J.....Greenwood.
Martin, S. J.....Rossland.
Marsh, Richard.....Spokane, Wash.
Marshall, H. Jukes.....Vancouver.
Marshall, William S.....Ladysmith.
Miles, Arthur D.....
Mitchell, Charles T.....Grand Forks.
McCormick, Alan F.....Ruth, Nevada.
MacDonald, Alex. C.....Vancouver.
McFarlane, James A.....Kaslo.
Nicholls, Frank.....Norway.
O'Sullivan, John.....Vancouver.
Parker, Robt. H.....Rossland.
Parsenow, W. L.....
Perkins, Walter G.....Basin, Montana.
Pickard, T. D.....
Richmond, Leigh.....
Robertson, T. R.....
Rodgers, Ch. B.....Vancouver.
Rombauer, A. B.....
Schroeder, Curt. A.....
Segsworth, Walter.....Toronto.
Sharpe, Bert N.....
Sim, Charles John.....England.
Snyder, Blanchard M.....
Steven, Wm. Gordon.....
Stewart, James W.....Portland Canal.
Stimmel, B. A.....Trail.
Sundberg, Gustave.....Mexico City.
Tally, Robert E.....Spokane, Wash.
Thomas, Percival W.....
Tretheway, John H.....
Turner, H. A.....
Vance, John F. C. B.....Vancouver.
Van Agnew, Frank.....Siberia.
Vaughan-Williams, V. L.....California.
Wales, Roland T.....
Watson, Wm. J.....Ladysmith.
Welch, J. Cuthbert.....Butte, Mont.
Wells, Ben T.....Ladysmith.
West, Geo. G.....Vancouver.
Whittaker, Delbert E.....Victoria.
Widdowson, E. Walter.....Nelson.
Williams, W. A.....Grand Forks.
Williams, Eliot H.....Nelson.
Wimberly, S. H.....Nevada, U. S. A.

Under section 2, subsection (2).

Archer, Allan.....
Brennan, Charles Victor.....Nova Scotia.
Browne, D. J.....Rossland.
Bryant, Cecil M.....Vancouver.
Blaylock, Selwyn G.....Moyie.
Cartwright, Cosmo T.....
Cavers, Thomas W.....Rossland.
Clothier, George A.....
Cole, Arthur A.....Cobalt, Ontario.
Cole, G. E.....Rossland.
Cole, L. Heber.....Phœnix.
Conway, E. J.....
Coulthard, R. W.....Toronto, Ontario.
Cowans, Frederick.....
Dawson, V. E.....Trail.
Dixon, Howard A.....Toronto, Ontario.
Galbraith, M. T.....
Gilman, Ellis P.....Vancouver.
Green, J. T. Raoul.....Blairmore.
Guess, George A.....Trail.
Gwillim, J. C.....Kingston, Ontario.
Heal, John H.....
Hilliary, G. M.....Idaho, U. S. A.
Holdich, Augustus H.....England.
Johnston, William Steele.....Lachine, Que.
Kaye, Alexander.....Vancouver.
Kendall, George.....Vancouver.
Lathe, Frank E.....Grand Forks.
Lay, Douglas.....Stewart.
Lewis, Francis B.....South Africa.
Merrit, Charles P.....
Musgrave, William N.....Mexico City.
Mussen, Horace W.....Siberia.
McArthur, Reginald E.....
McDiarmid, S. S.....
McLellan, John.....Queen Charlotte Islands.

Under section 2, sub-section (2).—Concluded.

McMurtry, Gordon O.....
McNab, J. A.....Trail.
McVicar, John.....Edmonton, Alta.
Maclennan, F. W.....Rossland.
Outhett, Christopher .....Kamloops.
Pemberton, W. P. D.....Victoria.
Reid, J. A.....Greenwood.
Ritchie, A. B.....
Scott, Oswald Norman.....
Shannon, S.....
Sharpe, G. P.....Midland, Ontario.
Sloan, David.....Three Forks.
Stevens, F. G.....Mexico.
Sullivan, Michael H.....Trail.
Sutherland, T. Fraser.....
Swinney, Leslie A. E.....
Thomson, H. Nellis.....Anaconda, Montana.
Watson, A. A.....Olalla.
Watson, Henry .....
Workman, Ch. W.....
Wright, Richard .....Rossland.
Wynne, Lewellyn C.....
Yuill, H. H.....Silverton.

Under section 2, subsection (3).

Carmichael, Herbert.....Victoria.
(Provincial Assayer.)
Harris, Henry.....
Kiddie, Thos.....Vancouver.
Sutton, W. J.....Victoria.
McKillop, Alexander.....Nelson.
Pellew-Harvey, Wm.....London, England.
Robertson, Wm. F.....Victoria.
(Provincial Mineralogist.)
Marshall, Dr. T. R.....Glasgow, Scotland.

PREVIOUSLY ISSUED UNDER THE "BUREAU OF MINES ACT, 1897," SECTION 12.

Pinder, W. J.....Dawson, Y. T.
Thompson, James B.....Vancouver.

EXAMINATIONS FOR COAL-MINE OFFICIALS.

During the year 1904, under the "Coal Mines Regulation Act Further Amendment Act, 1904," the regulations regarding the qualifications and examinations of officials employed in coal-mines were completely revised and at the same time made much more stringent and thorough.

The "Coal Mines Regulation Act," as now amended, provides that all the officers of a coal-mining company having any direct charge of work underground shall hold Government Certificates of Competency, which are to be obtained only after passing an examination before a duly qualified Board, appointed for the purpose of holding such examinations, and known as the Managers' Board. The certificates granted on the recommendation of such Board and the requirements for the same are as follows:—

FIRST-CLASS CERTIFICATE (or Manager's Certificate).

Such a certificate must be held by every manager or "chief officer having the control and daily supervision of any coal mine" in British Columbia. The statutory requirements for this certificate, in addition to such examination and qualifications as may be imposed by the Board of Examiners, are, that the candidate for examination shall be at least twenty-five years of age, a British subject, and have had at least five years' experience in or about the practical working of a coal-mine.

SECOND-CLASS CERTIFICATE (or Overman's Certificate).

Such certificate must be held by any person "who has the daily charge of the underground workings of a coal-mine under the control and daily supervision of the manager, and next in charge under such manager."

Aside from the requirements of the Board of Examiners, a candidate for such certificate must have had "at least five years' experience in or about the practical working of a coal-mine."

THIRD-CLASS CERTIFICATE.

This certificate must be held by every shiftboss, fireboss, or shotlighter in a coal-mine in British Columbia, and besides the examination by the Board, calls for three years' practical experience.

Experience in a coal-mine outside the Province may be accepted by the Board. Any certificate is considered to include that of any lower class.

EXAMINATIONS FOR MINERS.

In addition to the examinations and certificates already specified as coming under the Managers' Board, the Act further provides that every coal-miner shall be the holder of a certificate of competency as such. By "miner" is meant "a person employed underground in any coal-mine to cut, shear, break, or loosen coal from the solid, whether by hand or machinery."

Examinations for a miner's certificate are held each month at each colliery by a Board of Examiners, known as the Miners' Board, and consisting of an examiner appointed by the owners, an examiner elected by the miners of that colliery, and an examiner appointed by the Government.

Examinations for first, second, and third classes were held simultaneously at Fernie, Nanaimo, and Merritt on April 6th, 7th, and 8th, 1909, and for second and third class at Cumberland, April 6th and 7th, 1909.

BOARD OF EXAMINERS FOR COAL-MINE OFFICIALS.

FIRST, SECOND, AND THIRD-CLASS CERTIFICATES.

Report of Secretary of Board, Francis H. Shepherd.

I beg to submit the Annual Report covering the transactions of the above Board for the year ending December 31st, 1909.

The Board of Appointment of Examiners consists of Messrs. Andrew Bryden, Ladysmith, Chairman; Tully Boyce, Nanaimo, Vice-Chairman; Thos. R. Stockett, George Williams, and F. H. Shepherd, Nanaimo; Charles Simister, Fernie; and John John, Wellington. The Secretary's address is Nanaimo.

Examinations for First, Second, and Third-class Certificates of Competency were held simultaneously on April 6th, 7th, and 8th, 1909, at Nanaimo, Fernie, and Merritt; and for Second and Third-class Certificates of Competency at Cumberland, April 6th and 7th, 1909.

The list of applicants was unprecedentedly large, the total number applying for examination being 78—17 being for first-class examination, 24 for second-class, and 37 for third-class examination; of these, 10 were successful in the first class, 21 in the second class, and 32 in the third class.

Examinations for First, Second, and Third-class Certificates of Competency were held simultaneously on October 12th, 13th, and 14th, 1909, at Nanaimo and Fernie, and for First and Third-class Certificates of Competency at Cumberland and Merritt, there being no applications for second-class examination from the two latter places.

The total number applying for examination was 40—8 being for first class examination, 15 for second-class, and 17 for third-class examination; of these, 6 were successful in the first class, 11 in the second class, and 14 in the third class.

The fact that two examinations were necessary during the year was no doubt due to the increased activity in coal operations throughout the Province, and the consequent greater demand for certificated officials. It is true that many of the successful candidates do not avail themselves of the class of employment for which the certificate qualifies them, preferring, perhaps, to remain possibly better remunerated at the face or on other contract work, and the

shortage, especially of officials holding third-class certificates, sometimes complained of, is probably due to some extent to this cause, and partly to the disinclination on the part of the holders to sacrifice the freedom which the responsibility of the duties of fireman and shotlighter entail. Many of the candidates present themselves through purely commendable motives of self-improvement and study, looking upon the certificate as a testimonial or diploma which is easily carried and may be of service in the future. This being the case, the Board fully realises the necessity of holding examinations sufficiently often to supply the demands of the ever-increasing industry.

The general practical character of the examinations has been adhered to, and the standard adopted is the result of many years' experience gained by the Board, supplemented by many valuable suggestions obtained from examining Boards of other countries.

Since my last report the Government has passed legislation making the use of mine-rescue apparatus compulsory, and, as the new enactment is an amendment to the "Coal Mines Regulation Act," it is very desirable that intending candidates should include in their preparatory course some knowledge of the use and application of the oxygen and similar mine-rescue devices.

The general percentages earned were good throughout; this is due in some measure to the Board's custom of publishing the questions after each examination, so that intending candidates may know what standard of proficiency to attain in order to pass. While the general syllabus and standard is maintained, the questions are of course not repeated as to quantity and detail. Copies of these questions may be had upon application to the Secretary at Nanaimo.

I append hereto a list of the candidates who successfully passed the Examinations, of the various classes, held during the past year.

List of Successful Candidates. Examinations held April 6th, 7th, and 8th, 1909.

First-class Certificates.

Name.	Date.	No.
James Holden	May 1st, 1909	
J. S. Montgomery	"	
John Shanks	"	
Henry Devlin	"	
B. Caufield	"	
W. A. Davidson	"	
H. N. Freeman	"	
Samuel Shone	"	
Samuel McVicar	"	
William Lockhart	"	

Second-class Certificates.

Name.	Date.	No.
Moses Johnson	May 1st, 1909	B 75
David Gray	"	B 76
J. W. Dykes	"	B 77
T. Cunliffe	"	B 78
George Rogers	"	B 79

SUCCESSFUL CANDIDATES. EXAMINATIONS HELD APRIL 6TH, 7TH AND 8TH, 1909.—*Concluded.*

SECOND-CLASS CERTIFICATES.—*Concluded.*

NAME.	DATE.	NO.
T. Parkinson	May 1st, 1909	B 80
J. P. Bushell	"	B 81
George O'Brien	"	B 82
R. Fairfoyll	"	B 83
Fred Jarratt	"	B 84
Joseph Worthington	"	B 85
Enoch Francis	"	B 86
Wm. Eccleston	"	B 87
David Crawford	"	B 88
J. Virgo	"	B 89
J. Musgrove	"	B 90
A. Matuskey	"	B 91
J. McKelvie	"	B 92
L. Cawthorne	"	B 93
J. Biggs	"	B 94
J. M. Stewart	"	B 95

THIRD-CLASS CERTIFICATES.

NAME.	DATE.	NO.
James McCulloch	May 1st, 1909	C 315
Nathaniel Howells	"	C 316
Harry Massey	"	C 317
George Suik	"	C 318
W. McFegan	"	C 319
Ed. Hayes	"	C 320
J. Caufield	"	C 321
C. Mitchell	"	C 322
R. Adamson	"	C 323
A. G. Horrocks	"	C 324
James Sharp	"	C 325
M. McGarry	"	C 326
E. Roberts	"	C 327
F. J. G. Dollemore	"	C 328
G. Spencer	"	C 329
L. Shearer	"	C 330
J. Shortman	"	C 331
M. Robinson	"	C 332
W. Picton	"	C 333
W. Simister	"	C 334
J. Moore	"	C 335
A. Mansfield	"	C 336
B. R. Barlow	"	C 337
D. H. Beeton	"	C 338
William Davis	"	C 339
J. J. Doherty	"	C 340
L. Parker	"	C 341
T. Owen	"	C 347*
W. Hallinan	"	C 343
Thos. Skelton	"	C 344
T. Leeman	"	C 345
B. J. Barnes	"	C 346

* C 342 spoiled.

List of Successful Candidates. Examinations held October 12th, 13th, and 14th, 1909.

First-class Certificates.

Name.	Date.	No.
Robert Henderson	November 27th, 1909	
T. K. Knox	"	
T. A. Spruston	"	
T. C. Stevens	"	
James Gray	"	
Hugh Sloan	"	

Second-class Certificates.

Name.	Date.	No.
Thomas Brace	November 27th, 1909	B 96
N. Howells	"	B 97
W. Wesnedge	"	B 98
H. Massey	"	B 99
F. D. Alderson	"	B 100
W. J. Mazay	"	B 101
W. R. Foster	"	B 102
Geo. Rankin	"	B 103
Thos. Jordon	"	B 104
J. B. Thomas	"	B 105
W. McFegan	"	B 106

Third-class Certificates.

Name.	Date.	No.
David Brown	November 27th, 1909	C 348
Charles O'Brien	"	C 349
H. S. Kirkeberg	"	C 350
Robert Russell	"	C 351
Joseph Neen	"	C 352
J. H. Simister	"	C 353
Jas. Renney	"	C 354
R. L. Spruston	"	C 355
T. Phillips	"	C 356
W. Shenfield	"	C 357
F. Hutchison	"	C 358
J. T. Mawson	"	C 359
A. Frew	"	C 360
W. Joyce	"	C 361

Registered List of Holders of Certificates of Competency as Coal-mine Officials.

FIRST-CLASS CERTIFICATES.—SERVICE CERTIFICATES ISSUED UNDER SECTION 39, "COAL MINES REGULATION ACT, 1877."

John Bryden, Victoria.
Edward G. Prior.
Thomas A. Buckley.
Archibald Dick, Government Inspector of Mines.
James Dunsmuir, Victoria.
James Cairns, Comox, Farmer.

FIRST-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL MINES REGULATION ACT, 1897."

NAME.	DATE.
Shepherd, Francis H	March 5th, 1881
Gibson, Richard	" 5th, "
Honobin, William	May 1st, 1882
Little, Francis D	" 1st, "
Martell, Joshua	" 1st, "
Chandler, William	December, 21st, 1883
Priest, Elijah	" 21st, "
McGregor, James	January 18th, 1888
Randle, Joseph	" 18th, "
Matthews, John	" 8th, 1889
Norton, Richard Henry	August 26th, "
Bryden, Andrew	December 30th, "
Russell, Thomas	April 20th, 1891
Sharp, Alexander	October 27th, "
Kesley, John	March 4th, 1892
Wall, William H	May 30th, 1896
Morgan, Thomas	" 30th, "
Wilson, David	" 30th, "
Smith, Frank B	" 30th, "
Bradshaw, George B	June 12th, 1899
Simpson, William G	" 12th, "
Hargreaves, James	February 5th, 1901
Drinnan, Robert G	" 5th, "
Browitt, Benjamin	August 3rd, "
Stockett, Thomas, Jr	" 3rd, "
Pearson, Robert	" 3rd, "
Cunliffe, John	" 3rd, "
Evans, Daniel	" 3rd, "
McEvoy, James	October 17th, 1902
Wilson, A. R	" 17th, "
Simister, Charles	" 17th, "
Colville, Andrew	" 17th, "
Budge, Thomas	" 17th, "
Mills, Thomas	" 17th, "
Faulds, Alexander	" 17th, "
Richards, James A.	" 17th, "
McLean, Donald	January 21st, 1905
Wilkinson, Geo	" 21st, "
Wright, H. B	" 21st, "
Coulthard, R. W	" 21st, "
Roaf, J. Richardson	" 21st, "
John, John	" 21st, "
Manley, H. L	" 21st, "

First-class Certificates Issued under "Coal Mines Regulation Act Further Amendment Act, 1904."

Name.	Date.
Biggs, J. G.	July 22nd, 1908
Bridge, Edward	" 22nd, "
Caufield, B.	May 1st, 1909
Darbyshire, James	November 9th, 1907
Davidson, W. A.	May 1st, 1909
Devlin, Henry	" 1st, "
Elliott, Daniel	November 9th, 1907
Emmerson, Joseph	" 9th, "
Evans, Evan	" 9th, "
France, Thos	" 22nd, 1906
Fraser, Norman	March 4th, 1905
Freeman, H. N.	May 1st, 1909
Galloway, C. F. J.	July 22nd, 1908
Graham, Charles	November 14th, 1905
Graham, Thomas	" 9th, 1907
Gray, James	" 27th, 1909
Heathcote, Elijah	March 4th, 1905
Henderson, Robert	November 27th, 1909
Holden, James	May 1st, "
Jackson, Thos. R.	November 9th, 1907
James, William.	July 22nd, 1908
Keith, Thomas	November 9th, 1907
Knox, T. K	" 27th, 1909
Lancaster, W	July 22nd, 1908
Lockhart, Wm.	May 1st, 1909
Millar, John K	November 22nd, 1906
Montgomery, J. S.	May 1st, 1909
McGuickie, Thomas	July 22nd, 1908
McVicar, Samuel	May 1st, 1909
Newton, John	July 22nd, 1908
Saville, Luther	" 22nd, "
Shanks, John	May 1st, 1909
Shaw, Alex	November 14th, 1905
Shone, Samuel	May 1st, 1909
Sloan, Hugh	November 27th, "
Smith, Joseph	July 22nd, 1908
Spruston, T. A	November 7th, 1909
Stevens, L. C	" 27th, "
Strachan, Robert	March 4th, 1905
Williams, Thos. H.	November 22nd, 1906
Wylie, John	July 22nd, 1908

Second-class Certificate of Service.

Name.	Date.	Cer. No.
Corkhill, Thomas	March 4th, 1905	B 7
Morton, T. R	" 4th, "	B 8
Loe, John S	" 4th, "	B 9
Millar, J. K	" 4th, "	B 10
McCliment, John	" 4th, "	B 11
Martin, David	" 4th, "	B 12
Hunt, John	" 4th, "	B 13
Walker, David	" 4th, "	B 14
Short, Richard	" 4th, "	B 15
Powell, William Baden	" 4th, "	B 16
Sharp, James	" 18th, "	B 17
Bryden, Alexander	" 4th, "	B 18

SECOND-CLASS CERTIFICATES OF COMPETENCY ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."

NAME.	DATE.	CER. NO.
Alderson, F. D	November 29th, 1909	B 100
Barclay, Andrew	July 29th, 1905	B 25
Bastian, John	November 2nd, 1907	B 42
Biggs, J.	May 1st, 1909	B 94
Biggs, John G	November 2nd, 1907	B 40
Brace, Thomas	" 27th, 1909	B 96
Bridge, Edward	October 23rd, 1906	B 33
Brown, John C	" 23rd, "	B 39
Bushell, J. P	May 1st, 1909	B 81
Carroll, Henry	July 22nd, 1908	B 62
Caufield, Bernard	October 23rd, 1906	B 30
Cawthorne, L.	May 1st, 1909	B 93
Churchill, James	July 22nd, 1908	B 65
Cook, Joseph	" 22nd, "	B 64
Crawford, David	May 1st, 1909	B 88
Cunliffe, T.	" 1st, "	B 78
Daniels, David	November 2nd, 1907	B 53
Darbyshire, James	October 23rd, 1906	B 32
Devlin, Henry	November 2nd, 1907	B 44
Dunsmuir, John	" 14th, 1905	B 26
Dykes, J. W	May 1st, 1909	B 77
Eccleston, Wm	" 1st, "	B 87
Evans, Evan	March 11th, 1905	B 2
Fairfoyll, R	May 1st, 1909	B 83
Finlayson, James	July 29th, 1905	B 21
Foster, W. R	November 27th, 1909	B 102
France, Thos	" 14th, 1905	B 27
Francis, Enoch	May 1st, 1909	B 86
Francis, James	July 22nd, 1908	B 63
Freeman, Henry N	November 2nd, 1907	B 45
Gardner, John	July 22nd, 1908	B 68
Gillespie, Hugh	" 29th, 1905	B 24
Gillespie, John	October 23rd, 1906	B 36
Graham, Chas	March 4th, 1905	B 1
Gray, David	May 1st, 1909	B 76
Henderson, Robert	July 22nd, 1908	B 60
Howells, N	November 27th, 1909	B 97
Jackson, Thos. R	March 4th, 1905	B 5
James, David	November 2nd, 1907	B 58
Jarrett, Fred	May 1st, 1909	B 84
Johnson, Moses	" 1st, 1909	B 75
Jones, William	July 29th, 1905	B 20
Jones, William T	" 22nd, 1908	B 66
Jordon, Thos	November 27th, 1909	B 104
Lancaster, William	" 2nd, 1907	B 50
Lockhart, William	October 23rd, 1906	B 34
Massey, H	November 27th, 1909	B 99
Matusky, A	May 1st, "	B 91
Mazay, W. J	November 27th, "	B 101
Merryfield, William	July 22nd, 1908	B 61
Middleton, Robert	" 22nd, "	B 72
Monks, James	November 2nd, 1907	B 55
Morgan, John	" 2nd, "	B 43
Morris, John	July 22nd, 1908	B 67
Morton, Robert W	" 22nd, "	B 59
Musgrove, J	May 1st, 1909	B 90
McFegan, W	November 27th, "	B 106
McGuckie, Thomas M	October 23rd, 1906	B 35
McKelvie J	May 1st, 1909	B 92
McKinnell, David	October 23rd, 1906	B 37
McPherson, James E.	July 22nd, 1908	B 73
Nellist, David	March 4th, 1905	B 6
Newton, John	October 23rd, 1906	B 31
O'Brien, George	May 1st, 1909	B 82

Second-class Certificates of Competency Issued under "Coal Mines Regulation Act Further Amendment Act, 1904."—*Concluded.*

Name.	Date.	Cer. No.
Ovington, John	November 2nd, 1907	B 52
Parkinson, T	May 1st, 1909	B 80
Parnham, Charles	November 2nd, 1907	B 49
Rankin, Geo.	" 27th, 1909	B 103
Reid, Thomas	July 29th, 1905	B 23
Richards, Thomas	November 2nd, 1907	B 57
Rigby, John	July 29th, 1905	B 29
Robinson, William	" 22nd, 1908	B 69
Rogers, George	May 1st, 1909	B 79
Russell, Daniel	November 2nd, 1907	B 41
Russell, John	" 2nd, "	B 47
Saville, Luther	" 2nd, "	B 51
Shaw, Alex	July 29th, 1905	B 19
Somerville, Alex	March 4th, "	B 4
Spruston, Thos. A	November 2nd, 1907	B 46
Stewart, J. M	May 1st, 1909	B 93
Stockwell, William	November 2nd, 1907	B 56
Thomas, J. B	" 27th, 1909	B 105
Thomas, Joseph D	October 23rd, 1906	B 38
Tonge, Thomas	July 22nd, 1908	B 71
Vanhulle, Peter	November 2nd, 1907	B 54
Virgo, J	May 1st, 1909	B 89
Watson, Adam G	November 14th, 1905	B 28
Webber, John Frank	March 4th, 1905	B 3
Wesnedge, W	November 27th, 1909	B 98
White, John	" 2nd, 1907	B 48
Wilson, Thomas	July 22nd, 1908	B 74
Wilson, W	" 22nd, "	B 70
Worthington, Joseph	May 1st, 1909	B 85
Wyllie, John B	July 29th, 1908	B 22

Third-class Certificates Issued under "Coal Mines Regulation Act Further Amendment Act, 1904."

Name.	Date.	Cer. No.
Adamson, R.	May 1st, 1909	C 323
Almond, Alex	October 1st, 1907	C 252
Almond, W.	July 22nd, 1908	C 286
Baggaley, J.	" 22nd, "	C 300
Barlow, B. R.	May 1st, 1909	C 337
Barnes, B. J.	" 1st, "	C 346
Beeton, D. H.	" 1st, "	C 338
Biggs, John	March 4th, 1905	C 210
Birchell, Richard	October 1st, 1907	C 266
Blewett, Ernest	July 22nd, 1908	C 298
Bradley, William	" 22nd, "	C 291
Bridge, Edward	" 29th, 1905	C 223
Briscoe, F.	" 22nd, 1908	C 309
Brown, David	November 1st, 1909	C 348
Brown, Thomas	July 22nd, 1908	C 278
Brownrigg, J. H.	" 22nd, "	C 276
Bushell, Jas. P	October 1st, 1907	C 264
Catchpole, Charles	July 29th, 1905	C 227
Caufield, J.	May 1st, 1909	C 321
Cheetham, Ben	July 22nd, 1908	C 311
Clifford, William	" 22nd, "	C 313
Commons, William	" 22nd, "	C 304
Cooke, Joseph	March 4th, "	C 209
Crawford, David	" 4th, "	C 208

THIRD-CLASS CERTIFICATES ISSUED UNDER "COAL MINES REGULATION ACT FURTHER AMENDMENT ACT, 1904."—*Continued.*

NAME.	DATE.	Cer. No.
Cunningham, G. F	November 11th, 1908	C 229
Cunliffe, Thos	October 1st, 1907	C 265
Davis, William	May 1st, 1909	C 339
Devlin, Edward	October 23rd, 1905	C 241
Doherty, J. J	May 1st, 1909	C 340
Dollemore, F. J. G.	" 1st, "	C 328
Doney, John	March 4th, 1905	C 211
Douglas, D. B	October 23rd, 1906	C 235
Dykes, Joseph W	" 1st, 1907	C 24
Evans, D.	July 22nd, 1908	C 28
Francis, James	October 1st, 1907	C 25
Freeman, H. G	November 14th, 1905	C 230
Frew, A.	" 27th, 1909	C 360
Frodsham, Vincent	July 22nd, 1908	C 282
Graham, John	" 22nd, "	C 292
Hallinan, W.	May 1st, 1909	C 343
Halsall, J.	July 22nd, 1908	C 307
Hayes, Edward	May 1st, 1909	C 320
Hilley, Fred.	July 22nd, 1908	C 290
Hodson, R. H	March 4th, 1905	C 216
Horrocks, A. G.	May 1st, 1909	C 324
Horwood, S.	July 22nd, 1908	C 312
Howells, Nathaniel	May 1st, 1909	C 316
Hutchison, Ben.	November 14th, 1905	C 232
Hutchison, F.	" 27th, 1909	C 358
Jarrett, Fred. J.	October 1st, 1907	C 256
Jaynes, Frank	July 22nd, 1908	C 277
Jemson, J. W	March 4th, 1905	C 205
John, Howel	July 22nd, 1908	C 305
Johnson, Moses	October 1st, 1907	C 258
Jones, W. T.	March 4th, 1905	C 221
Joyce, W.	November 27th, 1909	C 361
Kirkeberg, H. S.	" 27th, "	C 350
Lancaster, William	October 23rd, 1906	C 243
Lane, Joseph	" 1st, 1907	C 254
Leeman, T.	May 1st, 1909	C 345
Liddle, John	July 29th, 1905	C 228
Malone, Patrick	October 1st, 1907	C 247
Mansfield, A.	May 1st, 1909	C 336
Manson, T. H.	July 22nd, 1908	C 280
Marsh, John	October 1st, 1907	C 270
Mason, J	July 22nd, 1908	C 297
Massey, Henry	May 1st, 1909	C 317
Mather, Thomas	July 22nd, 1908	C 293
Mattishaw, Samuel K	October 23rd, 1906	C 237
Matusky, Andrew	" 1st, 1907	C 259
Mawson, J. T.	November 27th, 1909	C 359
Merrifield, George	October 23rd, 1906	C 239
Merrifield, William	" 23rd, "	C 236
Mitchell, C.	May 1st, 1909	C 322
Monks, James	November 14th, 1905	C 234
Moore, George	October 23rd, 1906	C 242
Moore, J.	May 1st, 1909	C 335
Moreland, Thomas	July 22nd, 1908	C 299
Morgan, John	" 29th, 1905	C 224
McAlpine, John	March 4th, "	C 217
McBroom, Al	July 2nd, 1908	C 287
McCulloch, James	May 1st, 1909	C 315
McFegan, W.	" 1st, "	C 319
McGarry, M.	" 1st, "	C 326
McGuckie, Thomas	July 29th, 1905	C 226
McKelvie, J.	" 22nd, 1908	C 285
McLellan, William	March 4th, 1905	C 219
McLeod, James	July 22nd, 1908	C 296
McNay, Carmichael	" 22nd, "	C 306

Third-class Certificates Issued under "Coal Mines Regulation Act Further Amendment Act, 1904."—*Concluded.*

Name.	Date.	Cer. No.
McNeil, Adam T	July 22nd, 1908	C 281
Neen, Joseph	November 27th, 1909	C 352
Nelson, Horatio	October 1st, 1907	C 263
O'Brien, Charles	November 27th, 1909	C 349
Owen, T	May 1st, "	C 347
Parker, L	" 1st, "	C 341
Parkinson, T	July 22nd, 1908	C 289
Perry, James	March 4th, 1905	C 215
Philips, T	November 27th, 1909	C 356
Pickup, A	July 22nd, 1908	C 310
Picton, W	May 1st, 1909	C 333
Plank, Samuel	November 14th, 1905	C 233
Rallison, R	July 22nd, 1908	C 279
Rankin, George	" 22nd, "	C 275
Ratcliffe, Thomas	October 1st, 1907	C 253
Raynor, Fred	" 1st, "	C 257
Reilly, Thomas	July 22nd, 1908	C 303
Renny, Jas	November 27th, 1909	C 354
Richards, James	October 1st, 1907	C 249
Richards, Samuel	" 23rd, 1906	C 244
Rigby, John	July 29th, 1905	C 225
Roberts, E	May 1st, 1909	C 327
Robinson, M	" 1st, "	C 332
Roper, William	July 22nd, 1908	C 274
Russell, Robert	November 27th, 1909	C 351
Rutledge, Edwin	July 22nd, 1908	C 302
Saville, E. O	October 1st, 1907	C 251
Scott, Henry	July 22nd, 1908	C 294
Sharp, James	May 1st, 1909	C 325
Shearer, L	" 1st, "	C 330
Shenfield, W	November 27th, "	C 357
Shooter, Joseph	October 1st, 1907	C 261
Shortman, J	May 1st, 1909	C 331
Simister, J. H	November 27th, "	C 353
Simister, W	May 1st, "	C 334
Skelton, Thos	" 1st, "	C 344
Smith, Joseph	March 4th, 1905	C 207
Smith, Thos. J	October 1st, 1907	C 271
Sparks, Edward (C 314 issued in lieu of C 255 destroyed by Fernie fire)	" 1st, "	C 255
Spencer, G	May 1st, 1909	C 329
Sprusten, R. L	November 27th, 1909	C 355
Spruston, Thomas A	March 4th, 1905	C 206
Stewart, James M	October 23rd, 1906	C 240
Stockwell, William	" 23rd, "	C 238
Suik, George	May 1st, 1909	C 318
Taylor, Charles M	March 4th, 1905	C 213
Thomas, John B	November 14th, "	C 231
Thomas, Joseph	March 4th, "	C 220
Thomas, Warriett	October 1st, 1907	C 273
Thompson, Thomas	" 1st, "	C 267
Thompson, Joseph	" 1st, "	C 269
Thomson, Duncan	March 4th, 1905	C 218
Wallace, Fred	October 1st, 1907	C 260
Watson, Adam G	March 4th, 1905	C 212
Watson, George	July 22nd, 1908	C 288
Watson, William	October 22nd, 1906	C 246
Weeks, John	March 4th, 1905	C 214
White, John	October 22nd, 1906	C 245
Wilcock, J	July 22nd, 1908	C 308
Williams, Watkin	" 22nd, "	C 301
Wilson, Thomas	October 1st, 1907	C 272
Wilson, William	" 1st, "	C 262
Winstanley, H	July 22nd, 1908	C 283
Wintle, Thomas A	" 29th, 1905	C 222
Worthington, J	" 22nd, 1908	C 295

COAL-MINES OFFICIALS.

Third-class Certificates issued under "Coal Mines Regulation Act Further Amendment Act, 1904," sec. 38, sub-sec. (2), in exchange for Certificates issued under the "Coal Mines Regulation Act Amendment Act, 1901."

Name.	Date.	Certificate No.	Name.	Date.	Certificate No.
Adam, Robert	Oct. 12, 1904	C 42	Malpass, James	Nov. 7, 1904	C 113
Addison, Thos	Dec. 10, 1904	C 52	Marsden, John	May 3, 1904	C 21
Aitken, James	Oct. 24, 1904	C 44	Marshall, Howard	Dec. 6, 1905	C 127
Alexander, Wm	Feb. 17, 1905	C 72	Matthews, Chas	April 27, 1904	C 9
Allsop, Harry	Oct. 11, 1904	C 34	Miard, Harry E	March 3, 1905	C 76
Ashman, Jabez	Feb. 5, 1907	C 131	Middleton, Robt	Feb. 11, 1905	C 71
Aughinvole, Alex	March 29, 1905	C 89	Miles, Thos	Aug. 10, 1904	C 31
Barclay, Andrew	April 27, 1904	C 19	Miller, Thos. K	Feb. 21, 1905	C 74
Barclay, James	April 27, 1904	C 20	McKenzie, John R	Oct. 12, 1904	C 40
Barclay, John	April 17, 1905	C 111	McKinnell, David	March 29, 1905	C 99
Berry, James	Feb. 11, 1905	C 70	McKinnon, Arch'd	April 3, 1905	C 102
Bickle, Thos	Oct. 11, 1904	C 37	McMillan, Peter	March 29, 1905	C 94
Biggs, Henry	April 10, 1905	C 110	McMurtrie, John	March 29, 1905	C 96
Black, John S	April 3, 1905	C 108	Moore, Wm. H	June 17, 1905	C 119
Bowie, James	May 13, 1905	C 116	Morris, John	Dec. 27, 1904	C 57
Briscoe, Edward	Oct. 10, 1906	C 129	Myles, Walter	April 3, 1905	C 100
Campbell, Dan	March 29, 1905	C 93	Nash, Isaac	June 1, 1904	C 120
Carr, Jos. E	Oct. 11, 1904	C 36	Neave, Wm	Oct. 12, 1904	C 43
Carroll, Harry	March 29, 1905	C 98	Nellist, David	April 27, 1904	C 13
Clarkson, Alexander	April 27, 1904	C 18	Nelson, James	April 27, 1904	C 16
Collishaw, John	Feb. 7, 1905	C 68	Newton, John	Oct. 12, 1904	C 39
Comb, John	March 23, 1904	C 2	Nimmo, Jas. P	April 3, 1905	C 103
Cosier, Wm	March 29, 1905	C 86	O'Brien, Geo	Feb. 6, 1905	C 66
Courtney, A. W	Nov. 2, 1904	C 45	Pengelly, Richard	Dec. 27, 1904	C 58
Crawford, Frank	April 6, 1904	C 7	Perrie, Jas	March 15, 1905	C 81
Daniels, David	April 27, 1904	C 12	Perry, James	June 13, 1904	C 27
Davidson, David	April 3, 1905	C 106	Pounder, Geo	Oct. 16, 1905	C 125
Davidson, John	March 29, 1905	C 87	Price, Jas	Nov. 8, 1904	C 50
Devlin, Henry	Oct. 12, 1904	C 41	Rafter, Wm	March 29, 1905	C 95
Dobbie, John	Nov. 27, 1905	C 126	Reid, Thos	Nov. 3, 1904	C 47
Dudley, James	March 22, 1905	C 114	Reid, James	March 23, 1904	C 1
Duncan, Thomas	Aug. 29, 1906	C 128	Reid, Wm	Dec. 15, 1904	C 54
Dunlap, Henry	Nov. 21, 1904	C 51	Richards, Thos	April 27, 1904	C 14
Dunn, Geo	Dec. 19, 1904	C 56	Ross, John	April 3, 1905	C 101
Dunsmuir, John	March 29, 1905	C 90	Roughead, George	Jan. 30, 1907	C 130
Eccleston, Wm	March 15, 1905	C 80	Ryan, John	Dec. 28, 1904	C 59
Evans, Evan	March 13, 1905	C 78	Sanders, John W	April 3, 1905	C 107
Evans, W. H	March 14, 1905	C 79	Shenton, Thos. J	July 25, 1904	C 30
Fagan, David	April 6, 1905	C 109	Shepherd, Henry	June 13, 1904	C 26
Farmer, Bernard	Jan. 31, 1905	C 64	Smith, Ralph	March 7, 1905	C 77
Farquharson, John	April 27, 1904	C 17	Smith, Geo	March 29, 1905	C 84
Findlayson, James	June 6, 1904	C 25	Somerville, Alex	March 24, 1904	C 3
Fulton, Hugh T	April 3, 1905	C 105	Stauss, Chas. F	Feb. 9, 1905	C 69
Gibson, Edward	May 30, 1905	C 118	Steele, Jas	March 29, 1905	C 92
Gilchrist, Wm	March 29, 1905	C 85	Stewart, Duncan H	March 28, 1904	C 4
Gillespie, Hugh	April 6, 1904	C 8	Stewart, John	April 3, 1904	C 104
Gillespie, John	April 6, 1904	C 5	Stewart, Daniel W	May 16, 1904	C 23
Gould, Alfred	April 17, 1906	C 112	Stoddart, Jacob	Feb. 21, 1905	C 73
Green, Francis	Oct. 11, 1904	C 38	Strachan, Robt	April 27, 1904	C 15
Handlen, Jas	June 16, 1904	C 122	Strang, James	April 27, 1904	C 10
Harmison, Wm	Feb. 3, 1905	C 65	Thomas, John	March 29, 1905	C 97
Haworth, Geo	March 29, 1905	C 88	Tunstall, James	June 15, 1904	C 121
Hescott, John	Jan. 16, 1905	C 62	Vass, Robt	Dec. 12, 1904	C 53
Hutchison, Archie	Sept. 8, 1905	C 123	Vater, Charles	April 6, 1904	C 66
John, David	Nov. 8, 1904	C 49	Walkem, Thos	Dec. 16, 1904	C 55
Johnson, Geo	May 9, 1904	C 124	Webber, Chas	Sept. 13, 1904	C 32
Johnson, Wm. R	March 1, 1905	C 75	Webber, Charles F	Sept. 13, 1904	C 33
Kerr, Wm	March 29, 1905	C 91	Whiting, Geo	May 29, 1905	C 117
Lauder, Frank	Jan. 9, 1905	C 61	Wilson, Austin	Feb. 7, 1905	C 67
Landfear, Herbert	Jan. 27, 1905	C 63	Wilson, Thos	April 27, 1904	C 11
Lewis, Thos	Oct. 11, 1904	C 35	Woodburn, Moses	March 29, 1905	C 83
Lockhart, Wm	Jan. 6, 1905	C 60	Yarrow, Geo	Nov. 3, 1904	C 46

CARIBOO DISTRICT.

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CARIBOO AND QUESNEL MINING DIVISIONS.

REPORT BY GEORGE WALKER, GOLD COMMISSIONER.

I have the honour to submit herewith my report on mining operations in Cariboo District during the year 1909, accompanied by the statistics in tabular form, from which it will be seen that the gold yield of the district, taken as a whole, is a trifle under the output of last year. The cause of the decrease in the output was the light snowfall of last winter and the exceptionally dry weather during the spring, which shortened, by at least a month, the working season of the hydraulic mines, which produce almost all the gold in the district.

Several extensive enterprises have been entered upon during the season, notably by the Quesnel Hydraulic Mining Company, of Twenty-mile creek, the owner of several mining leases on Twenty-mile creek, a tributary of the Quesnel river, which is constructing a ditch of large dimensions, some twenty-five miles in length, to convey the waters of Swift river to the property.

The West Canadian Deep Leads, Limited, the owner of several mining leases on Little Valley creek, after determining the depth of the deep channel of this creek by means of a boring machine, has now a crew of twenty-five men at work on its property building a camp and sinking a shaft to bedrock.

THE CARIBOO MINING DIVISION.

In the Cariboo, or Barkerville, Mining Division of Cariboo District the result of the season's operations has been fairly good, but shows a slight decrease from that of last year.

WILLIAMS CREEK AND TRIBUTARIES.

I am indebted to the manager, Mr. John Hopp, for the following report on the properties operated by him :—

"The *Mucho Oro* mine, situated on Stouts gulch, a tributary of Williams creek, was worked about the same as last year, utilising the same amount of water with about the same results ; approximately 300,000 cubic yards were moved this season.

"The *Forest Rose* mine, situated on the east bank of Williams creek, using the same plant and the same number of men as last year with slightly increased water, moved approximately 175,000 yards of gravel.

"At the *Lowhee* mine, situated on Lowhee creek, the same plant was used and the same number of men were employed as last year, until the 1st of August, and 60,000 cubic yards of gravel moved. Five and one-half miles of new ditch, with a 5-foot bottom and one-to-one slope, was built to connect with a smaller ditch, which was increased from a 3-foot bottom to 4½ feet, with a one-to-one slope to the banks, having a capacity of delivering 3,000 miner's inches under a vertical head of 400 feet at the mine. The plant installed consists of 30-inch, 22-inch, and 18-inch diameter pipe, with a No. 6 Joshua Hendy monitor. These works are completed and all in order for next season's work. The work yet to be done consists of a new double-compartment sluice-flume of 3 feet and 4½ feet in width respectively, the extension of

the main ditch from the penstock to a point about one mile up-stream, where it is proposed to build a dam 15 feet in height across Lowhee creek, to make a flushing reservoir, to extend the ditch from the present head at Jack of Clubs creek to Ella lake, where a dam has been commenced for reservoir purposes and which is now completed 24 feet in height. This dam has been planned to stand for a height of 100 feet, and I propose to build from 40 to 50 feet higher next year, and the balance the following season. There is also an opposing ditch leading from Jack of Clubs creek over the top of the dam, to deliver the water from Jack of Clubs creek to the reservoir when not being used; also an extension from the reservoir to Lightning creek to receive the water of Lightning creek. I propose to complete this work next year and to install a plant on Olallie creek of the same dimensions, pipe, monitor, and flume, as that installed on Lowhee creek, when the Burns creek ditch will be utilised to deliver water for this plant.

"On Mosquito creek, the *Alabama* and *Williams* hydraulic mines were worked with the same plant and number of men as the previous year, but owing to the light snowfall the amount of gravel moved was considerably reduced, though the results from the above-mentioned properties were very satisfactory.

"The new work for the season consists of the following: Installed a new sluice-flume 2½ feet bottom by 3 feet in depth, on 6-inch grade per box of 12 feet in length. The ditches were enlarged to a 3-foot bottom with a one-to-one slope, and extended from the *Alabama* ditch to a point between Red gulch and Mosquito creek, where the new plant and penstock were installed, and the *Williams* mine ditches extended to connect at this point with a 15-inch and 14-inch pipe and a No. 4 Joshua Hendy monitor, with approximately 200 feet pressure."

The First of May Hydraulic Mining Company, on upper Williams creek, continued work again this season, the result of which I have been unable to ascertain.

Lightning Creek and Tributaries.

I am indebted to the president and manager of the Lightning Creek Gold Gravels and Drainage Company, Mr. C. H. Unverzagt, for the following report:—

"During the season of 1909 the company has been doing construction work in getting ready to do effective mining; about a carload of miscellaneous new equipment has been placed on the ground, and an outfit, consisting of boilers, engines, and pumps, has recently been purchased. As soon as the additional boiler is in place mining work at the No. 2 shaft will begin. The plant is at present operated by steam power, but as soon as the new flume is constructed, all the power will be furnished by a turbine water-wheel which is now installed. It is also the intention to install a 200 horse-power electric generator with various motors, to be used in connection with an electric-driven pump for general power purposes; the Cornish pumps will be removed from the No. 1 shaft. There has been sufficient drilling work done on the ground to demonstrate the values to be of a satisfactory character, and therefore there is no occasion for additional drilling work until the ground already drilled is mined out. The pump equipment at the No. 2 shaft is good for at least 2,000,000 gallons daily, and the electric-driven turbine pump is to be installed at the No. 1 shaft, and will be good for 3,000,000 gallons daily; an average of 1,500,000 gallons is, from tests made, believed to be of sufficient capacity to keep the water pumped out. The company estimates that it will require about 300 horse-power for the pumping of the two shafts and for other purposes. With the completion of the new flume giving a 50-foot head, it will have available 500 horse-power from its turbine. In case of low water, if it becomes necessary to use steam, the company now has all the boilers and engine capacity for a 200 horse-power auxiliary steam plant, which will be duly installed at the No. 1 shaft to supplement the turbine-power, if required.

"The No. 3 shaft, which is on a bench about 50 feet deep, has been equipped with a steam-pump and steam-hoist. It is the intention of the company to use compressed air as a substitute for steam, on such of its machinery as requires steam, as soon as the new flume is completed."

Venture Mining Company, Peters Creek.

Regarding this company, Mr. L. Ford, the foreman, says :—

"Since last report the work done by the Venture Mining Company has been altogether development. We have continued the shaft to a depth of 50 feet, whence a tunnel has been run 80 feet in the direction of the creek, with the object of reaching the deeper ground; but, being apparently too deep, an upraise has been started, and owing to the approaching winter season, for economic reasons, the company has decided to suspend operations until spring, when the work will be resumed and a thorough test made of the values of the deep ground of the creek."

Fountain Creek Mining Company, Fountain Creek.

Regarding this company's work, the foreman, Angus McPherson, reports as follows :—

"On May 6th, 1909, the pump was started, and after twenty days of pumping the mine was unwatered and work was resumed underground, with two shifts of six men to run a drift up-stream to reach bedrock, the shaft not being deep enough. The drift was run 400 feet up-stream, but bedrock was not found, and, owing to the surface water giving out, the means by which the water-wheel was run, the company decided to shut down for the season."

Eight-mile Lake.

The Thistle Company, operating at Eight-mile lake, reports as follows :—

"Hydraulicking was commenced on the 24th of May, 1909, a crew of ten men being employed, and it was necessary to wash about 10,000 cubic yards of gravel, clay, soil, etc., in order to clean up the pit washed off in 1908. An hydraulic gravel elevator was installed to raise the bottom gravels into the flume. A prospect tunnel 160 feet in length has been driven along the course of the channel, and next season the property will be opened as a drift mine, it not being feasible to work the mine by the hydraulic method on account of grades, dumpage, etc."

Antler Ceek and Tributaries.

I am favoured with the following report from B. A. Laselle, manager of the China Creek Hydraulic Company's mine :—

"A late, backward spring made it impossible to obtain sufficient water to commence hydraulic operations until May 27th, after which the supply was steady and a fair season's work was accomplished. The fall water was above the average, partly making up for the late start in the spring. At this mine the channel has narrowed down from over 250 feet to about 150 feet in width, which in future will make it much easier to work with the gold values better concentrated. No new work has been done or required, and from all present indications next year should prove a banner year for this mine."

Nugget Gulch.

Of this mine Mr. B. A. Laselle, the manager, says :—

"Hydraulicking commenced at this mine on the 27th day of May and continued until July 20th, after which the clean-up was made and the work of extending the present ditch system 1,600 feet farther up the channel was completed and the penstock and pipe-line moved, thereby shortening up the latter nearly one-half. A short fall run was obtained. The

gold values have materially increased and the management feels that the mine is proving itself to be fully as satisfactory as anticipated."

The Waverly Company, of Grouse creek, again continued work this year, with fairly satisfactory results.

Mr. W. F. Gore continued work on the *Guyat* claim this year, completing his ditch, etc., and the mine is now fully equipped for next season's work.

Little Valley Creek.

I am indebted to the manager, Mr. L. A. Bonner, for the following report:—

"The West Canadian Deep Leads Company was formed to exercise the option held by the original syndicate upon leases situate on Little Valley creek. Two cross-sections were made in 1908 by means of a Keystone driller to establish the depth, gradient, and position of an assumed channel; the results of such borings, in the opinion of Professor S. Herbert Cox, A.R.S.M., the company's consulting engineer, warrants the outlay necessary to sink a shaft 260 feet to bedrock, to cross-cut the channel and test for gold. Much preliminary work was necessary, particularly in the construction of a waggon-road in order to haul in the somewhat heavy machinery purchased for the property.

"The shaft now started has two winding compartments 4 feet 4 inches by 6 feet each in the clear, and one pumping compartment of 7 feet 6 inches by 6 feet. Two 80 horse-power and one 36 horse-power boilers have been provided. Cameron sinking pumps are to be employed, as far as their capacity will allow, and two 18-inch Cornish pumps, driven by a cross-compound Corliss engine, are to be used as station pumps. Should payable dirt be encountered, an hydro-electric plant will be introduced for power purposes. It is anticipated that about 30 men will be employed during sinking operations."

Office Statistics—Cariboo District.

Free miner's certificates issued, company	9
" " " individual	293
Records and transfers of placer-mining claims	55
Leaves of absence	21
Water records issued	3
Placer-mining leases issued	24
" " cancelled	49

Revenue Receipts.

Free miner's certificates	$ 2,031 75
Mining receipts, general	27,732 36
Leaves of absence	62 50
Land sales	115,485 02
Land revenue	576 50
Revenue Tax	2,250 00
Real-property tax	3,744 96
Personal-property tax	2,650 81
Wild land tax	23,583 37
Income tax	135 19
Licence, spirits	1,740 00
" trade	1,110 00
J. P. Court fines	645 00
Miscellaneous	177 89
Licences, game	600 00
Total	$ 182,525 35

QUESNEL MINING DIVISION.

REPORT BY C. W. GRAIN, MINING RECORDER.

I have the honour to submit herewith my report on mining operations in the Quesnel Mining Division of the Cariboo District for the year ending December 31st, 1909. The past year cannot be considered good as regards revenue; in fact, the revenue is considerably less than last year, owing to the number of placer-mining leases given up by the Cariboo Gold Mining Company and the Bullion Gold Mining Company, both of which companies are controlled by Messrs. Guggenheim, of New York. Although these companies have given up a large number of their leases, they yet hold considerable property in the division, on which, it is hoped, they will again work. Work on a large scale has been started by the Quesnel Hydraulic Gold Mining Company, under the superintendence of Mr. H. W. DuBois, mining engineer, of Philadelphia, U. S. A., on and in connection with its properties on Twenty-mile creek, Quesnel river. The property has been most carefully prospected by Mr. DuBois for the last two years, and this fall he started work on the construction of his pipe-line and dam on Swift river; the dam, I understand, will be 600 feet in length and 45 feet high, from which the water will be conveyed some twenty-five miles by ditch and pipe, with some tunnel work, to the company's leases on Twenty-mile creek. At present the company is much hampered by the difficulty of transportation, having had to build many miles of road and a cable ferry across the Quesnel river. Mr. DuBois has even now a large force of men at work, which will be greatly increased as spring approaches. It is yet too early to say anything as regards the value of these properties that the company intends working, but Mr. DuBois has carefully prospected the ground and considers that it justifies the enormous preparatory outlay which is being made by the company.

In the Horsefly section of the division, where considerable prospecting work was done last year, the Independence Mining Company, a small local company, has been formed and has started work this season. I am indebted to Mr. A. J. Patenaude, a shareholder in this company, for the following report:—

"The Independence Mining Company's property consists of three bench leases situated at and below the Forks of the Horsefly river, about fifty miles above Harper's Camp. The company began operations in June, employing a force of eight men for the entire season, by digging a ditch some 4,800 feet in length and making a bridge over the South Fork of the river to carry the flume. This ditch, for about 500 feet, had to be blasted out of the solid rock on a perpendicular face some 80 feet above the river. Whilst this was being done, the pack-train of ten horses was packing in some 18,000 lbs. of steel pipe and the necessary supplies, over a very rough trail for some forty miles. We intend working this property by hydraulic elevator, with a pressure of 150 feet vertical head. We put in our 15-inch elevator at a depth of 20 feet, but, owing to the quicksand flowing in, we deemed it unsafe to go farther in such small space without timbering. As far as we have sunk, our gravel runs from 20 cents to $2 per cubic yard, gold, medium coarse. With the prospects in sight we are more than pleased, and it is our intention next spring to sink to bedrock, with the hope of striking the gold-bearing channel that carried the gold to the *Ward* claim, out of which some $160,000 in coarse gold was taken, as we have proved this summer that the gold taken from our claim is identical with that taken from the *Ward* claim."

KEITHLEY CREEK AND TRIBUTARIES.

On Snow-shoe creek the *Luce* hydraulic, employing a force of eight men, had a fairly successful season, considering the poor water-supply, and the results showed an improvement in the values contained in the gravels, the average for the past season being $1.25 per yard, as against 50 cents per yard the previous season.

The Baer Creek Company operated with a small force with very satisfactory results, considering the poor water-supply and the heavy and frequent slides from the side-hill.

The *Hayward* hydraulic was operated by Mr. Borland with disappointing results.

In this district there have been a few new claims taken up, on some of which considerable work has been done with encouraging results. On the Quesnel river, from the mouth up, three dredging leases were taken up, and on the Fraser river, from Quesnel down, seven leases were taken up, but at present I have not learnt when work will be commenced on them.

From the Clearwater country I have not yet heard, as the small party working there has remained over the winter for trapping.

LOCKEPORT, KLUNKWOI BAY, EAST COAST MORESBY ISLAND.

CASSIAR DISTRICT.

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ATLIN MINING DIVISION.

Report of J. A. Fraser, Gold Commissioner.

I have the honour to submit my report on mining operations in the Atlin Mining Division of Cassiar District for the year ending December 31st, 1909, which, in most respects, does not differ materially from those of late years. There was about the same number of people in the district this year as last, viz.: between 600 and 700 during the summer and between 350 and 400 during the winter; of whom from 300 to 350 were engaged in mining during the summer and perhaps 75 to 100 this winter, and while there has been a slight falling off in some sources of revenue, there has been an increased output and aggregate revenue over last year.

There have not been any new discoveries reported, and, with very few exceptions, those engaged in mining in the district have confined their operations to the known deposits and have not wandered far afield in search of new—even on the creeks upon which they have been working for years.

McKee Creek.

The contemplated reorganisation of the companies operating on McKee creek, suggested in last year's report, was duly effected during the year, the result being an organisation known as the "Pittsburg-British Gold Company, Limited," which has been systematically acquiring all the property of the "McKee Consolidated Hydraulic Co., Ltd.," the "Amalgamated McKee Creek Mining Co., Ltd.," and all private holdings on the creek, so that it will practically be in position to absolutely control McKee creek and to operate without much chance of interference or interruption. The company's operations this year were entirely under the direct supervision of Fletcher T. Hamshaw, and about twenty-eight men for five months and about fifteen men for two and a half months were employed. The water-supply was very good throughout the season, which, in conjunction with the convenient and systematic arrangement of the plant described in last year's report, enabled them to secure the best possible results and to win a very considerable increase over last year's output. While the larger installation foreshadowed in last year's report has not yet been consummated, some important additions and improvements were introduced, notably a system of manganese-steel plates and riffles which has been substituted for the wooden riffle-blocks commonly used, and which has proven to be an unqualified success, in that it materially increases the efficiency of the water used by enabling it to carry or move the boulders and other débris on a flatter (lesser) grade without the assistance of a flume tender, thus increasing the available dump-room and reducing the expense of operation. About $20,000 is said to have been expended in these and other improvements to the plant, and much more extensive improvements are said to be contemplated.

There are no independent individual operators on the creek.

Pine Creek.

From twenty to thirty individual miners worked on Pine and Gold creeks during the season, with indifferent results. No new ground was opened up, and what had proven good in former seasons was practically worked out.

The North Columbia Gold Mining Company, under the management of J. M. Ruffner, commenced operations on the 16th of April with a force varying from thirty to seventy-three men, and continued until the 9th November—nearly seven months. This company, having last fall completed its immense water-supply ditch to a convenient point for operation, had to commence operations this season by transferring its several pipe-lines from the old ditches to the new, which took about a month, so that water was turned on in No. 1 pit on May 15th and in No. 2 pit on May 22nd. Three No. 6 giants, with 6 and 7-inch nozzles (used alternately), were operated in each pit, and also one giant in each pit for stacking tailings. In addition to this, there was a "bank-head" or "by-wash" of about 1,500 miner's inches used in No. 1 and about 3,500 in No. 2 pit. Operations in No. 2 pit were closed down on October 30th, and in No. 1 on November 9th. Another pit was opened a half-mile or more farther up-stream, in which two No. 4 monitors were used, one in the pit and the other on the dump. The excessive cold of last winter caused the frost to creep farther into the banks than during any previous winter in this company's experience, so that there was from 20 to 25 feet of solidly frozen gravel to break through all along the face, which, from the nature of their operations, embarrassed them for at least half the season. This company was singularly unfortunate this season through the bursting, on the 17th June, of its dam at the head of Pine creek, by which the waters of Surprise lake were conserved. Owing to this break, a volume of water representing a depth of 5 or 6 feet, over an area about eighteen miles in length by an average width of three-fourths of a mile, escaped absolutely and carried away several bridges and a considerable portion of the ditch-bank, which had to be cribbed when rebuilt. The loss of the water and the damage done to the ditch, in addition to the cost of replacement, delayed the mining operations about a month during the best part of the season, which was a great loss to the company. Notwithstanding all this, the ditch was repaired and the dam rebuilt in a better position, so as to be apparently impregnable, and the company "cleaned up" about double the amount of gold recovered last year.

The Atlin Consolidated Mining Company, Limited, did not operate its steam-shovel this season, but contented itself with importing a large quantity of new plant, which the company intends to install in time for the coming season's operations.

On the upper portion of "Gold Run" L. B. Harris continued prospecting with his Keystone drill, finding bedrock at depths varying from 29 to 40 feet, and although this is his third season and he has not yet announced the discovery of the "pay-streak" for which he is searching, he is determined to continue operations, being still sanguine of ultimate success.

Spruce Creek.

There were about 100 men mining on this creek during the season, of whom from seventy to ninety were operating by individual methods—viz., wheels, China and steam pumps, drifting, etc.—and with about the usual results.

The Spruce Creek Power Company, Limited, under the superintendence of W. C. Hall, operated with from seven to twenty men and three or four hydraulic monitors, from May 4th to October 4th (five months), and recovered more gold than in any previous season but one, I believe. This company also did considerable prospecting by means of drifts and tunnels into adjacent bench ground, of which it controls a large area, and of which some is known to be rich. Operations were closed down early, principally for want of water, but it is probable that the company will be in possession of a materially increased supply before the end of next season, as definite steps to that end are being taken.

There are a few "outfits" drifting on this creek this winter.

Birch Creek.

On this creek from fifteen to twenty men were engaged throughout the season, with very fair results. The water-supply was better than for some years past, by which the operators profited, although the unusual depth of frost was a hindrance to successful operation.

Messrs. Pearse & Co., operating the ground and hydraulic plant of the Dominion Trust Company, with from eight to twelve men, commenced piping in May and continued until late in October. They handled about 34,000 cubic yards of gravel and uncovered about 52,000 square feet of bedrock, winning about as much gold as they did last season. Although they had a better supply of water than in former years, they had worked up-stream so far that the pressure was very materially diminished and, unfortunately, were unable to profit by the extra supply. Since closing down in the fall the company has been engaged in preparing for the removal of the pressure-box up-stream to a point which will give about 200 feet of "head," and good results may be expected. Four men will be engaged during the winter preparing for the next season's operations.

Boulder Creek.

From thirty to forty men were engaged on this creek during the season, and, in most cases, as usual, with very fair returns. On the ground held by the Société Minière de la Colombie Britannique, whose operations are under the superintendence of T. Obalski, M.E., work was carried on by drifting in winter and hydraulicking in summer, with very good results. This company is engaged putting in a long covered drain to tap some deep ground, which was partially worked some time ago by drifting and hoisting, and which was found very rich, but was very wet, dangerous, and expensive. Should the rich deposit be found extensive, this plan of operation cannot fail to provide very satisfactory returns. Altogether, with a slightly increased force, about double the quantity of gold was won from this creek this season as was recovered in 1908.

Ruby Creek.

On this creek the Placer Gold Mines Co. (of Seattle), under the management of T. M. Daulton, with A. Radford as foreman, and a force of from six to thirty-five men, an average of twenty men commenced operations on April 1st and continued until October 19th. During that period it constructed a water-supply ditch 3,500 feet in length and a flume 1,200 feet in length, with a capacity of probably 3,000 miners' inches, down to the pressure-box, thence over 1,000 feet of hydraulic pipe to the point of operation. The company has also excavated 500 feet of ditch and built over 500 feet of sluice-flume below this point. I understand it is the intention of the management to introduce plates and riffles similar to those described in the report on McKee creek, and when this is done it will have what may be regarded as one of the most complete and capable hydraulic installations in the north. The excellent supply of water, the high grade of the creek, giving the pressure in a short distance, and the known richness of the ground, justifies the expectation of splendid results from the operation of this plant.

Wright Creek.

On this creek from seven to nine men were engaged during the season, with satisfactory results. They contemplate continuing.

Otter Creek.

On the upper portion of this creek the Otter Creek Development Company, under the management of J. E. Moran, operated with six men for the first two months, and with five for the rest of the season. There was uncovered about 3,000 square yards of bedrock and about 54,000 cubic yards of gravel were moved, working against a face of about 50 feet in

height. The gravel appears to be well charged with gold, but, unfortunately, the early cold snap prevented the cleaning up of bedrock, so that the full results of the season's operations are unknown. The gold will all be recovered early next season.

On the lower part of Otter creek the Maluin Syndicate continued piping to reach bedrock, but had not quite succeeded when the first cold snap compelled it to close down. The operations, which were carried on under the superintendence of W. H. Brethour, were commenced on May 10th and closed down about October 20th. The company began the season by enlarging the supply ditch, moving the pressure-box about 1,000 feet up-stream, and repairing damage caused by the bursting of a reservoir near the head of the creek. Piping with two No. 4 giants with 6-inch nozzles was carried on from June 7th until October 20th, but as the piping was against a bank of about 140 feet in height, progress was not rapid, although a large amount of material was moved.

During the season a storage dam, partly built last season about half-way up the valley, was completed and utilised, with very satisfactory results. During the season's operations the present creek-bed, or channel, was piped into the sluice and a fair amount of gold recovered, but what they are seeking is the old channel which appears to lie beneath this immense bank of gravel, the removal of which requires much water and dump-room, both of which it fortunately possesses or can procure. The company is sanguine of reaching bedrock early in the coming season and realising the anticipations of rich pay thereon.

Wilson Creek.

On this creek from seven to ten men were operating, with indifferent results. The valley is wide and comparatively flat and the pay-streak is difficult to follow, which has a discouraging effect upon the operators, most of whom have not the means to prospect such ground systematically. The creek is certainly rich in places, but may perhaps be "spotted." Four men are reported as wintering on the creek.

Some prospecting was done on Consolation and Lincoln creeks, but nothing encouraging has been reported.

Some prospecting was also done on Union, Horse, Hemlock, and Cracker creeks, which are all tributaries of Surprise lake, and sufficiently encouraging results obtained to induce the parties to locate and apply for leases upon them, and I have reason to believe these leases will be systematically prospected this coming season and, if found satisfactory, will be equipped with hydraulic plants, the capital for which is being supplied by parties in Eastern Canada, London, and Paris.

Mineral Claims.

I regret to say that nothing more than the assessment work necessary to keep them in good standing appears to have been performed on any of the mineral claims throughout this portion of the district, but the necessary procedure for the procurement of Crown grants has been undertaken with respect to quite a number of claims.

In the vicinity of Bennett lake are several promising properties which apparently require very little additional development to advance them into the shipping class, but their present holders have not as yet been able to place them there.

Rainy Hollow.

In this section of the district quite a large number of claims are being Crown-granted, but nothing beyond necessary assessment work has been done on other claims, except by the Alaska Iron Company and Burnham & Kennedy. The waggon-road which the Provincial Government has opened from the International boundary at Pleasant Camp to Jarvis river,

although not completed, has made it possible to ship supplies in and ore out by horse-team, and the parties above mentioned are taking advantage of it to ship some of the bornite ore to the smelters. Burnham & Kennedy, anticipating the construction of the road, prepared for shipment from 100 to 200 tons of choice ore from the *Maid of Erin* claim during the summer, which will be shipped this winter. The Alaska Iron Company, under the management of its president, W. S. Brown, shipped a few tons of high-grade ore during the summer, and this winter there are about ten men engaged on the *State of Montana* claim, mining and preparing ore for shipment, which will be hauled to Haines (Alaska) by the company's own teams.

I may say that some discoveries of the same class of high-grade ore have recently been made about five miles to the east or south-east of the claims above mentioned, and a number of claims have been located which will demand attention (and a road) in the near future.

There was also the discovery of a large ledge of free-milling ore reported last fall, upon which about a dozen claims have already been located. It is situated in the heart of the "Rainy Hollow District" (so called), and if upon development the values justify the expectations created by the assay returns from samples submitted, an additional impetus will be given the mining industry in that section.

I regret to say that no attempt has been made during the year to develop the deposits of hydro-magnesite which lie within and adjacent to the town of Atlin, nor of the coal deposits which were located late in 1908, but I have no doubt that the coal at least will receive attention as early in the coming season as the disappearance of snow will permit.

Following is a statistical report of revenue collected, etc., for the year 1909, all of which is respectfully submitted:—

OFFICE STATISTICS, 1909—ATLIN MINING DIVISION.

Free miner's certificates (individual)		458
" " " special		3
" " (companies)		11
Placer records		24
" re-records (321) representing claims		339
Leaves of absence (65) "		217
Groupings		6
Abandonments		1
Permissions		4
Bills of sale, placer		46
" hydraulic		52
" mineral		36
Mineral records		105
Certificates of work		155
Filings		25
Certificates of improvements		25
Gold reported (individuals)—oz. 4,209. Value	$ 66,621 00	
" (companies) " 8,025. "	125,396 20	
Total	$192,017 20	
Royalty paid (individuals)	$ 542 90	
" (companies)	2,210 10	
Total	$ 2,753 00	

Revenue Collected, 1909.

Land sales	$	55 55
Timber royalty		166 63
Free miner's certificates (individual)		2,167 75
" " " special		45 00
" " (companies)		905 00
Mining receipts (lease rentals)		14,450 00
" (" deposits)		340 00
" (water records and rentals)		855 50
" (other sources)		3,774 85
Leaves of absence		542 50
Licences (spirit)		1,300 00
" (trade)		210 00
Fines and forfeitures		216 55
Registry fees		29 00
Marriage licences		25 00
Law stamps		49 65
Revenue tax		936 00
Assessment Act real-property tax		3,421 60
" personal-property tax		151 75
" wild-land "		11 15
" income "		51 55
" mineral "		2,753 00
" Crown-granted mineral-claim tax		407 00
" interest		17 60
Miscellaneous receipts		4 75
Total	$	32,887 38

STIKINE AND LIARD MINING DIVISIONS.

FROM REPORT OF JAMES PORTER, GOLD COMMISSIONER.

I have the honour to submit my annual report on mining operations in the Stikine and Liard Mining Divisions of Cassiar District for the year ending 31st December, 1909.

I regret to say that, in some respects, the past season has been the most unsatisfactory experienced in many years. There is really nothing new to report; the conditions are practically the same as previously reported. No new finds of any moment have been recorded, and even the recording of assessment work on mineral claims has decreased, although this only means that a number of worthless claims have been allowed to lapse.

It is of interest, however, to mention that several mineral claims situated on the Iskut river, owned by E. S. Busby, Inspector of Canadian Customs, together with F. E. Bronson and others, of Wrangel, Alaska, have been partly developed and have been showing up well; about a ton of high-grade copper ore has been sent out to the smelter at Ladysmith as a sample.

There were fewer prospectors than ever in the district this past season, partly due to the fact of the Hudson's Bay Company's steamer not making its usual trips up the river, owing to the demand for the boat on the Skeena river.

The hydraulic mines of Berry creek and Thibert creek were not operated this past year.

I have been unable to get any very exact data as to the yield of placer gold in this district this year, but suffice to say that it was deplorably small.

The general office statistics of revenue show a decrease, which is mainly due to the fact that many of the mining-lease rentals have not been paid in, and are in arrears.

Messrs. James Rosenthal and Adolph Kurz, of Chicago, mentioned in a previous report as holding some seventeen mineral claims in the vicinity of McDame creek, brought in a gang of men, accompanied by a mining expert and an assayer, to do the assessment work on their claims and to examine and make tests of the ore values.

During the summer twelve coal locations were staked on the Tuya and the Tahltan rivers and prospecting licences applied for, and I believe these were granted in each case, so that it is possible there may be some move in this direction during next season.

In reviewing the situation here as regards mining, while I have not much to report of work in progress, I would again point out the tremendous area of the district which is as yet quite unprospected or even explored, and the fact that placer gold has been found in many portions of it, particularly at the mouths of the larger streams flowing down from the mountains, and that this section lying between Atlin and Dease lake on the north and Cariboo on the south-west is crossed by the flow of gold-bearing gravels, as was pointed out by the Provincial Mineralogist in his report of last year on the Ingenika district.

SKEENA DISTRICT.

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REPORT BY J. McMULLIN, GOLD COMMISSIONER.

I have the honour to submit herewith my annual report as Gold Commissioner for the Skeena Mining Division, for the year ending December 31st, 1909.

My appointment as Gold Commissioner of this district was only made last fall, after most of the mining work of the season was completed; consequently, I am not able to give as full particulars of the work done as I should like to do.

Portland Canal and Observatory inlet have been the centres of mining activity in this district during the past year. These camps were reported on by the Provincial Assayer last fall, since when I have had no further information, other than that development work has been carried on continuously on a couple of the properties, with satisfactory results.

A number of new locations were made on Alice arm, Observatory inlet, during the past year, and it promises to become as important a camp as Stewart, being probably on the same mineral belt. Statutory assessment work was done on all previous locations.

The Hidden Creek Mining Company, on Goose bay, Observatory inlet, has been closed down for a portion of the season. It is the intention of the company to resume operations early this season.

On Khutze inlet there is a group of claims owned by Martin & Shannon, of Vancouver, viz.: the *Ida*, *Bair*, *Goat*, *Anna*, *Joanna*, *Alice*, *Lulu*, and *Happy Jack*, on which considerable work has been done this season. Applications for certificates of improvement are pending on the above-mentioned claims.

At Bella Coola development work has been continued on the property owned by the North Coast Copper Company. The necessary assessment work has been done on other claims in this district.

KITIMAT.

The following notes, regarding the Kitimat section of this Division, have been sent in by the Deputy Mining Recorder at Kitimat:—

On account of the lateness of the season and other unfavourable conditions, very little development or prospecting was done in this district in the past year, excepting the usual assessment work on the *Caledonia* and *Drumlummon* group of claims in Kiskatlah bay, Douglas channel, midway between Hartley bay and Kitimat. In the course of development the lenses of ore increased in width and the quality of the product remains about the same as on the surface. A small amount sent to the Ladysmith smelter gave returns of 9.2 % copper, 3.84 oz. silver, and 0.01 oz. gold per ton. The ore is principally copper glance, with occasional bursts of chalcopyrite. The value of the former stands high, assays as high as 76.3 % copper and 48 oz. silver, with a little gold, being the result of the Provincial Government Mineralogist's test. The owners, Messrs. Sloan and McLennan, contemplate the driving of a tunnel about 300 feet long to tap the ore-body at a depth of 125 feet on the 60° dip of the lenses, when it is confidently expected a large body of this high-grade ore will be encountered, and the output will pay for further development. This group was thoroughly examined in July by a mining

LOOKING UP LYDDEN CREEK, FROM RED CLIFF MINE DUMP.

engineer of Victoria, and his report is very encouraging. A peculiarity of this group is the occurrence of chalcopyrite in the country rock, traced along an east and west strike for a distance of over 2,000 feet.

Amongst the meritorious properties in this district may be mentioned that of the Lindeborg Brothers, who have a vast deposit of magnetite on Iron mountain. In places, considerable amounts of chalcopyrite occur, and it is expected that further development will show up still more.

Charles Moore has also a number of claims on the same mountain, and they show up well. An American capitalist has been feeling his way in this direction, and this summer may see something doing.

Messrs. Steele and Dunn, who own the *Golden Crown* group of copper-gold claims on Wahu creek, behind the Indian reservation, report the property to be holding its own. They have a large lead, and the gold values obtained from their ore go high. On other properties in the neighbourhood very little has been done. A few locations have been made, but the results of the prospecting have not yet come to hand. If the weather is more favourable this year, we may expect to hear of further finds in this practically neglected district.

Office Statistics—Skeena Mining Division.

Free miner's certificates	704
Mineral claims recorded	410
Certificates of work issued	399
Bills of sale, bonds, etc	163
Certificates of improvements	27

Revenue.

Free miner's certificates	$3,288 35
Mining receipts, general	4,904 05
Total	$8,192 40

PORTLAND CANAL DISTRICT.

REPORT OF HERBERT CARMICHAEL, GOVERNMENT ASSAYER.

Portland canal is the most northerly inlet on the coast of British Columbia, and forms the boundary between that province and Alaska. This International boundary, the position of which was definitely decided upon some few years ago, has now, in this portion of it at least, been laid out on the ground, and its position clearly marked by monuments or by a cutting through the forests where such occur. The settlement of this boundary has relieved claim owners of much uncertainty as to which country their claims lie in, and should stimulate development on both sides of the line. The canal, or fiord, communicates with the open sea at Dixon entrance, and from that point runs nearly due north a distance of 55 miles to its head. It possesses few and indifferent anchorages, since the shores on either side are precipitous mountains with, in places, peaks which rise almost perpendicularly to heights of 6,000 feet. About 35 miles from the head of the canal, on the east side, is Maple bay (marked Maple point on the chart), a small bay affording good shelter but with rather deep anchorage. The two rivers, the Bear and the Salmon, at the head of Portland canal, are separated by a high bare ridge of mountain that forms the International boundary line, trending off to the west. On the east side of the valley of Bear river a mountain range extends in an east and west direction, the highest peak of the range, mount Disraeli, being a snow-clad pinnacle 7,000 feet high. The valley of the river is about a mile wide, composed of gravel and sand dotted with cottonwood and alder trees. It extends easterly in a straight line, with a gradual rise, for ten miles, until an elevation of 400 feet is attained. From this point the river and creeks rise more rapidly, becoming mountain torrents. With very little work a good waggon road could be made up the valley for ten miles or more. An excellent bridge, some 1,300 feet long, has been built across Bear river by the Provincial Government. This bridge has been of great aid in opening up the district, there being now a fairly good waggon road for six miles from tide-water, and further work is being done which will enable waggons to reach a point four miles farther up the valley.

Communication up Portland canal is maintained weekly by a steamer from Prince Rupert. There is an hotel at Stewart, at the head of the canal. Attention was first drawn to Portland canal when, on the 4th of May, 1898, a party of 64 persons from Seattle landed at the head to look for placer diggings at the source of the Naas river. Some 21 of the party went over the divide from Bear river and down the Naas river and struck "colours," but no pay placers. Some of the men still believe that if the "grub" had held out they would have found diggings worth staying with. Two or three of the party wintered on the canal and staked in the spring of 1899 what is now the *Roosevelt* claim, on Bitter creek, while the *Stewart* claim, on American creek, was staked in 1902, and the principal claims on Glacier creek in 1905-06. That part of the district included in the watershed of Glacier creek was examined by the Government Assayer in 1906, and since then the results following development work have been distinctly encouraging, the older properties having opened up ore bodies of a good shipping grade, while new claims have been located on very promising surface showings.

The country rock on the east side of Bear river is an argillite* traversed by felsitic dykes, and in this argillite rock fissures can be traced for miles. These fissures are for the most part

* This is a fine-grained, iron gray rock having a distinct schistose structure. It is rusty along the joint planes. The microscopic section shows fine parallel lines of minute grains of magnetite in a very fine granular base of a dull gray colour. There are also present a few larger grains of pyrite and of feldspar. It seems to be a very fine-grained sediment, perhaps altered by proximity to some igneous intrusion. It might be called a ferruginous argillite.

filled with quartz carrying values principally in gold, silver and lead, with sometimes a little copper. These form the quartz veins of the district.

There are places where, through movement, these fissures have been filled with the slate country rock, leaving very little room for the silicious mineral-bearing solutions which came up at a later period. The veins at these points present a brecciated structure, with often only a slight quartz cementation and carrying low values, but on further prospecting the argillite has given place to quartz again and the former good ore values have returned.

This fact encourages the further prospecting of claims which show now only a fissure largely filled with brecciated slate, but there is reasonable assurance that if further drifting on such well-defined fissures is continued quartz will come in and yield pay ore.

The regularity and permanence of these veins are very encouraging. There do not appear to be any serious faults and, in one case at least, a vein can be traced for over two miles; the felsitic dykes present the same regularity and run parallel with the veins for long distances.

No rock in place is to be seen on the floor of the valley below Bitter creek, the depression being filled with coarse gravel. On the west side of the valley the country rock is igneous, mostly granitoid near the head of the canal, but changing towards the north. These rocks will be better classified when rock sections have been made. The mode of occurrence of ore differs on this side of the valley from that on the south side, but the same relatively high gold values are maintained.

The majority of the mineral claims so far recorded have been located on the different branches of Glacier creek, which flows into Bear river four and a half miles from the head of Portland canal. The position of the different creeks and claims can be seen by referring to the sketch map herewith. There is now a very good waggon road from tide-water to Glacier creek, over which supplies can be hauled to, or ore from, this camp, and the flat at the mouth of the creek forms an excellent base from which to distribute supplies or collect ores from the different branches of Glacier creek. The most development work has been done on the south fork of Glacier creek, and properties on this branch will be first described.

South Fork of Glacier Creek.

Head office, Duncan, B. C.; mine office, Glacier creek, Portland canal.

Portland Canal Mines, Ltd. The company has acquired the following claims, viz.: The *Gipsy*, *Extension*, *Herbert*, *Mayflower*, *Mosquito*, *Richard II.*, *Barney*, *Sadie*, *Eclipse*, *Little Joe Fraction*, *Little Joe* and *Lucky Seven*, all situated on the south fork of Glacier creek. The principal work has been done on the *Lucky Seven* and *Little Joe*, and since these claims were last reported on by the Mines Department a large amount of development work has been done, principally on the main vein, which runs through the *Lucky Seven*, *Little Joe* and other claims. This vein is a fissure in the country rock which has been filled with an ore-bearing solution of quartz. In places the fissure is entirely filled with quartz; in others a considerable quantity of the country rock is included in the vein, which at these points has a marked brecciated structure. At places in the tunnels the fissure has been so filled with shattered country rock as to leave little room for mineral-bearing solutions, but within a short distance this gives place to a complete quartz filling, yielding a large body of high grade ore. The country rock, locally called a slate, is a ferruginous argillite and there are two felsitic dykes in close proximity to the vein and having the same strike and dip.

Since the last report the original tunnel (now known as No. 2), which was started a little below the vein, was continued till the vein was reached, when, turning slightly to the south-east, the vein has been followed for the entire length of the tunnel, or 125 feet. This tunnel is in good ore nearly all the way, the vein having an approximate width

of 10 feet. The mineralisation consists of iron pyrites, carrying gold, argentite, native silver, and high grade galena. A general average of the dump was taken for the company by Mr. W. J. Elmendorf, mining engineer, and gave the following values:—Gold, 0.3 oz.; silver, 11.9 oz.; lead, 5.05 %. That there are very rich ore pockets there can be no doubt, as samples carrying high values can easily be picked out. One rich streak, 15 inches wide, assayed as follows:—Gold, 1.2 oz.; silver, 48.8 oz.; lead, 4.29 %. A noteworthy fact is that the best pay streak is in the centre of the vein.

At 70 feet from the portal of this No. 2 tunnel a crosscut is being run to connect with a raise from the tunnel below. Simultaneously with No. 2 tunnel, No. 1 tunnel has been run in on the vein, the portal being 110 feet east of No. 2 tunnel and 39 feet above it. In this drift the vein shows rather more movement than in the tunnel below, the vein altering slightly in both dip and strike, but coming back again to the same general strike. At 65 feet in the vein takes a sharp turn to the south-west, and was followed by a drift 32 feet long, but the ore-body coming back to the original strike, it was decided to continue the drift from the 65-foot point of departure in a southerly direction. In a short distance the main ore body was again picked up, and the face is in good ore at 162 feet in.

The mineralisation is the same as in No. 2 tunnel, but high-grade pockets and streaks of ore are more plentiful, native silver being much in evidence. Average assays from this tunnel discarding the high grade samples, may be taken as:— Gold, 0.25 oz.; silver, 14.6 oz.; lead, 5.8 %. Higher grade samples gave the following assays:—Gold, 0.98 oz.; silver, 293.1 oz.; lead, 0.82 %.

Following the vein in an easterly direction as it goes round the hill, several open cuts have been made on its outcrop. The ore here has been subject to surface alteration and lead carbonate replaces the galena. What is known as the upper open cut is 359 feet east and 105 feet vertically above No. 1 tunnel. The vein at this point is shown to be 10 feet wide and well mineralised. Average assays of 8 feet of this ore-body by Mr. Elmendorf gave: Gold, 0.15 oz.; silver, 3.0 oz.; lead, 2.4 %.

The lower open cut is 61 feet east of No. 1 tunnel and 17 feet above it. The vein is from 8 to 10 feet wide and with a mineralization similar to the upper open cut. Samples of very high grade ore are easily obtained, but Mr. Elmendorf gives the average obtained by him as follows: Gold, 0.2 oz.; silver, 20.0 oz.; lead, 7.6 %.

It is intended that No. 3 drift shall be the main working tunnel of the mine. The portal is 175 feet north-west of No. 2 tunnel and 55 feet lower down the hill. The entrance is but a short distance from the site selected for the ore bunkers and for the upper terminal of the aerial tramway, at an altitude of 2,400 feet above sea level. This tunnel follows the general strike of the vein in an easterly direction for 245 feet, but appears, however, to be more on the foot-wall side of the vein and so below the main pay chute. For the first 140 feet the fissure includes a lot of crushed country rock, with quartz, carrying rather erratic values. At 200 feet in, free silver is found, and 20 feet further high grade stringers of quartz, 10 inches wide, were followed by a drift to the north for 20 feet. At the end of No. 3 drift, or 240 feet in, a raise has been started on a slope of 45°, to connect with the level above, from which a short cross-cut is being run. At 20 feet vertically above the lower level the raise cuts diagonally the main ore chute before mentioned, with approximately the same values.

While the pay chute does not show up so strongly in No. 3 tunnel, yet high grade ore is found on what appears to be undoubtedly the same vein in the *O. K. Fraction* at 600 feet lower altitude, so that while the values will undoubtedly vary with different parts of the vein, there is nothing to indicate that they will decrease with depth.

The *Gipsy* claim, lower down the hill, has been located on what may prove to be an offshoot from the main vein. A small stream has uncovered a quartz vein 2 feet wide along the

intrusion of a porphyritic dyke, which has cut the country rock with a strike of N. 50° E. The dip of the vein is 65° to the S. E. A shaft was sunk on this showing to a depth of 75 feet, but was full of water when visited. The quartz vein matter is well mineralised with iron pyrites and galena, and is reported to have given from 1½ to 4 oz. of gold per ton. Mr. Elmendorf gives the following as an average of 3 feet across the ore outcrop: Gold, 1.2 oz; silver, 5.4 oz.; lead, 5 %. Samples taken by the Government Assayer and assayed in the Government Assay office gave the following returns:—Gold, 2.1 oz.; silver, 14.7 oz.; lead, 12.8 %; copper, none. The vein is reported to be 6 inches wide in the bottom of the shaft and to carry good values, but work was discontinued at this point in favour of pushing on development on the *Little Joe* and *Lucky Seven*.

The company have been advised that they have enough ore assured to warrant them in building an aerial tramway and concentrator. The tramway right of way and concentrator site have been cleared, and the erection of both tram and concentrator are being pushed to completion as rapidly as possible. The tramway runs from the flat at the mouth of Glacier creek to just below No. 3 tunnel, a distance of 8,500 feet, and a difference in altitude of 2,100 feet. The concentrator will be built immediately below the lower tramway terminal, the whole plant being well situated for easy and cheap handling of ore.

One thousand inches of water have been recorded on Glacier creek and the water will be taken round the hillside by a short flume to Pelton wheels at the concentrator. The flume-bed has been graded, the head obtainable will be 100 feet, and the first wheel to be installed will develop 60 h.p. It is also proposed to put in a 6-drill compressor.

The concentrator will have a capacity of 50 tons per day, but the crushing end will be sufficiently large to permit of doubling the rest of the plant if necessary. The equipment will consist of a Sturtevant crusher, 2 sets of rolls, 4 jigs, a Lane mill, 1 Overstrom and 1 Wilfley table, and 2 Frue vanners.

The hauling of the concentrates 4½ miles to tide-water presents little difficulty. There is a fine grade for a waggon road or a sleigh road in winter, but it is likely that a tram road will be constructed up the valley, which will still further cheapen transportation.

The Portland Canal Mining and Development Co., Ltd., is to be congratulated on the success which has followed its efforts to develop a mine in this section, and the favourable report of Mr. Elmendorf is fully borne out by an examination of the ground.

There seems every reason to believe that the main vein of the Portland Canal Mining Co. follows right round the basin of the south fork of Glacier creek in a south-easterly direction, disappearing under the glacier from which this fork of the creek is fed. Thence to the north it follows down the hill, crossing Glacier creek some distance below the Forks and follows northward a general zone of fracture or movement in the country rock. This vein may fairly be said to have been traced at least three miles, claims having been located on outcrops for about this distance.

Matheson and Rudge's Claim. Adjoining the *Little Joe* to the south, Matheson and Rudge have located a claim on what appears to be a continuation of the *Little Joe* vein. A tunnel has been run in 18 feet, cutting a quartz vein which is strongly mineralized with iron pyrites and showed a brecciated structure. The dip and strike are approximately the same as in the *Little Joe*, but enough work has not been done to determine the width of the vein, though it may be taken as about 10 feet, averaging $4 in gold across the face.

Cook and Dobson's Claim. This property is situated to the east of the Matheson and Rudge claim and is supposed to be on a continuation of the *Little Joe* vein. Owing to the precipitous nature of the ground, this claim cannot easily be reached from the *Little Joe* claim and was not visited, but it is reliably

reported that short tunnels have opened up a quartz vein similar to that seen on the Matheson claim adjoining. The property is best reached by following the main trail up the south fork of Glacier creek.

From the last-mentioned claim, the outcrop of the *Little Joe* vein appears to swing round the head of the south fork of Glacier creek in a north-easterly direction, following the contour of the basin and outcropping in a spectacular manner on the *Jumbo* claim.

Jumbo.

The *Jumbo* claim, owned by Sam Gurley and R. B. Dodge, is reported to have been bonded to other parties. It is situated at the headwaters of the south fork of Glacier creek, at an altitude of 2,190 feet, at a distance of about 3½ miles from Bear river. This quartz vein outcrops on a bluff 100 feet high, and can be seen a long distance away. It dips into the hill at an angle of 22° and shows on the diagonal a mineralised face 40 to 50 feet wide, the mineralisation consisting of lead carbonate and galena, with iron pyrites. Examination of this face is distinctly dangerous at the present time, owing to the overhanging and broken nature of the rock, slabs of quartz of a ton weight being ready to drop at any time. In fact, there are tons of the ore now lying below the bluff which have fallen from it. Very little work had been done since the property was last visited, but it is certainly worth more vigorous development.

Average samples of the good ore gave the following assay:—Gold, 0.03 oz.; silver, 47.2 oz.; lead, 69.2 %; zinc, 1.5 %.

Hallie.

This claim is owned by Ike Thomson, of Stewart, B. C., and is situated on the south branch of Glacier creek, a short distance above the Forks. At this point, where the rocky banks of the creek come close together and rise abruptly, the creek is seen to cut through a quartz vein in what is locally known as the "slate formation." This quartz vein has been prospected on the right bank of the creek by a tunnel into the hillside, 22 feet long, and by several open cuts farther up the hill, which rises at a slope of 45°. The tunnel runs in on the strike of the vein, N. 45° E., dip 10° S. E.; the vein is from 6 to 8 feet wide, showing a brecciated structure, and is well mineralised with iron pyrites, with in some places solid pyrites, for 8 to 10 inches in width, carrying gold and silver values; the vein also carries small values in copper. Samples taken assayed as follows:—Gold, 0.12 oz.; silver, 6.0 oz.; copper, 0.8 %.

Apex.

The *Apex* mineral claim, owned by D. J. Rainie, of Stewart, B. C., is on the top of the divide between the south and middle forks of Glacier creek, at an altitude of 2,800 feet. Little work has been done on this claim beyond a few shots, which show a quartz mineralisation, several feet wide, in a greenstone country rock, carrying some iron pyrites; strike, approximately E. & W. The claim has only been located lately and sufficient work has not yet been done to demonstrate its value.

Middle Fork of Glacier Creek.

Evening Sun.

The *Evening Sun* mineral claim is owned by Rush & Baggs, of Stewart, B. C., and is reached by following a trail up the middle forks of Glacier creek. The mine cabin is at an altitude of 1,950 feet, some 50 feet above the creek on the south side, the claim being on the opposite side of the creek. The bank rises at an angle of 40°, and, at 250 feet above the creek, a tunnel, 64 feet long, has been run into the hillside on the strike of the vein, which is N. 37° E., the dip being vertical with true and well defined walls. A fissure in a greenstone country rock, 4 feet 6 inches wide, is seen to be filled with felsitic material interbanded with barite seams from 2 to 16 inches wide. The mineralisation is largely pyrites, with some galena and a little gray copper. A sample across the face of the tunnel is reported to have given $10, principally in silver, while the solid iron pyrites gave 89 oz. in silver and 0.2 oz. in gold. Samples taken from the baritic portion of

the vein gave the following assay:—Gold, 0.12 oz.; silver, 157.4 oz.; copper, 0.8 %. About 75 feet to the left of the main vein a smaller but similar vein has been prospected by a series of open cuts.

Columbia.

The *Columbia* claim, also owned by Rush and Baggs, is on the opposite side of the creek from the *Evening Sun* claim, where a small stream follows the course of a fissure down the hillside. At 300 feet above the creek a tunnel has been run 19 feet into a brecciated quartz vein in a greenstone country rock, 5 feet wide with good walls, the strike being S. 35° W. and the dip vertical. It is probable that this is the same vein as that seen across the creek in the *Evening Sun*. The vein filling is similar, with the difference that there is more quartz and some blende, and the vein matter also encloses more brecciated country rock. There is an 8 to 10 inch seam of galena which is reported to run as high as 100 oz. to 200 oz. in silver; a streak of blend also runs 76 oz. in silver.

Lake View Group.

Lake View Nos. 1 and 2 mineral claims are owned by Messrs. Bibeau and McKay. To reach these claims the main trail up the south side of Glacier creek is followed for 1½ miles, where Bibeau and McKay's trail turns off to the left and follows up a small creek a distance of about three-quarters of a mile. The trail rises rapidly at first, but towards the top flattens out considerably. At an altitude of 2,200 feet above Bear river a quartz vein, outcropping in a small creek, has been prospected for a distance of 200 feet by trenches and open cuts sunk to the vein through two feet of peaty mould and two feet of broken slate. A shaft, 45 feet deep, has been sunk on the hanging wall and the vein was crosscut at 25 feet, where it is reported to have had a width of 52 inches, well mineralised with galena, blende and a little copper pyrites. The owners had to abandon the further sinking of the shaft last fall, owing to the amount of water, but it is proposed to continue this work during the coming winter, when water will not interfere so much and better provision will be made for handling it. Assays of the clean ore gave the following result per ton:—Gold, 0.08 oz.; silver, 44.0 oz.; lead, 16 %; zinc, 13.5 %.

North Side of Glacier Creek.

Stewart Mining & Development Co., Limited.

This company owns the following claims, situated on the north side of Glacier creek:—*Silver King*, *Silver King No. 1*, *Silver King Fraction*, *Sunbeam*, *Sundown*, *Ben Hur Fraction*, *Ben Hur* and *George E.* The claims are reached by following a trail up the north side of Glacier creek for a short distance and then swinging round to the north, the mine cabin being about 1¼ miles from the mouth of Glacier creek at an altitude of 1,100 feet. A large fracture and zone of movement in the country rock extends for the length of several claims in a north and south direction, in which several of the fissures formed by the movement are filled with quartz, forming quartz veins. There seems little reason to doubt that these are the same veins seen in the Portland Canal Company's properties, as they are traced by outcrops through the different claims into that company's ground. The principal work has been done on the *George E.* claim, where three distinct veins are to be seen, known locally as the "East vein," the "Main vein," and the "West vein." The fissuring of the country rock has formed a gulch over a hundred feet deep, with precipitous sides. This gulch extends for about 3,500 feet down to Glacier creek, the creek being 750 feet below the *George E* cabin. The quartz veins just mentioned outcrop on a ridge to the east of the gulch. The country rock is the argillite noted on the *Little Joe* claim of the Portland Canal Company.

The "East vein" outcrops on the bank of a creek running parallel to the big gulch and emptying into Glacier creek. A short tunnel and several open cuts expose a well defined quartz vein 7 feet wide, mineralised with pyrite, argentite and a little galena, and is reported to

carry values from $8 to $60 per ton. Samples taken by the Government Assayer assayed from 0.12 oz. in gold to 0.56 oz. in gold, and from 5.4 oz. in silver to 30 oz. in silver, per ton. The strike of the vein is N. 15° W., dipping about 77° to the west, the walls being well defined, but enough work has not been done to determine this with accuracy. A felsitic dyke occurs on the footwall similar to that see on the footwall of the *Little Joe* claim, an indication that it may be the same vein.

Some 50 feet west of the "East vein," what is locally known as the "Main vein," has been prospected by a series of open cuts. It is similar in character and mineralisation to the "East vein," but sufficient work has not yet been done to demonstrate its value.

On the brow of the hill, about 180 feet above the gulch, some open cuts show a quartz vein and a number of smaller quartz stringers, which are known as the "West vein." About 10 feet below the outcrop, No. 1 tunnel has been run in 6 feet crosscuting the vein, and showing a width of 2 feet 6 inches of quartz well mineralised with pyrites, a little galena, argentite and native silver. From an open cut 20 feet to the left of the tunnel high values are said to have been obtained.

Some 15 feet below No. 1 tunnel, another crosscut tunnel, known as No. 2, has been run 10 feet, cutting the quartz vein seen in the upper tunnel, which here is about 4 feet wide and has a quartz filling mixed with the slate country rock and some secondary calcite veinlets. The general formation twists and flattens out a little at this point, having an approximate dip of 42° to the S. W.

Sixty feet below this tunnel, No. 3 crosscut tunnel has been run in from the gulch a distance of 35 feet. At 27 feet in a quartz vein 6½ feet wide was crosscut, probably the same vein seen in the two tunnels above, as it has the same appearance, the quartz filling being mixed with slate. In the tunnel the strata shows considerable twisting, and on the walls there is a two-inch crushed zone of slate with a secondary filling of calcite. The quartz is mineralized with pyrites and a little galena. Samples taken by the Government Assayer gave gold, 0.52 oz.; silver, 1.48 oz. The values, however, will vary considerably, as native silver can be seen in some of the samples.

Sixty feet below No. 3 tunnel and some few feet above the bottom of the gulch, No. 4 tunnel is being run into the hillside, the portal of the tunnel being 250 feet vertically below the *George E.* cabin. This is intended as a prospect tunnel to crosscut, with about 180 feet of depth, the veins seen on the surface. The topography of the ground and the dip of the veins favour this mode of prospecting, and while there is barely sufficient data on which to base a calculation as to where these veins will be struck, yet the running of this long tunnel does not appear to be nearly so risky a proceeding as it is in many other prospects. It is expected that the "East vein" will be struck when the tunnel is in 240 or 250 feet.

When visited, the tunnel had been driven 54 feet in a S. 75° E. direction in a slate country rock, and a quartz impregnation, carrying a little iron and copper pyrites, was coming in and may prove to be the same vein seen in No. 3 tunnel.

On the opposite side of the gulch is a quartz vein 10 feet wide, but no work has been done on it.

The Little Wonder* or the Lulu.

The *Little Wonder* mineral claim, owned by Chapman and Ranch, of Stewart, is reached by following the creek down from near the outcrop of the "East vein" of the *George E.* until the south line of this claim

*Since the above was written a question has been raised as to the ownership of the ground herein described, inasmuch as it is covered by two locations, that of the *Little Wonder* and of the *Lulu* mineral claims. Surveys of the claims have been made, but the notes of such have not yet been received by the Surveyor-General, so that nothing can be stated officially as to the ownership of the ground through which the veins run.

TUNNEL, AMERICAN GIRL CLAIM.
The mouth of the tunnel is on the vein. Vein matter also shows above and to the left.

EAST VEIN, GEORGE E CLAIM.

is reached, and this forms the north boundary of the *Little Wonder* claim. It is more than likely that all the veins seen in the *George E.* claim extend into this ground; the "East vein" is easily traced, as it forms the bed of the creek for the most of the way; the "Main vein" has also been uncovered by a number of open cuts. At 100 feet from the south line of the *George E.*, and 300 feet vertically below the *George E.* cabin, an open cut shows the "East vein" to be 5 feet wide, with clean walls and a quartz filling mixed with slate and mineralised with iron pyrites and galena. The owners report that the following values were obtained from samples: gold values, $8 to $48 per ton; solid iron pyrites went $8 in gold and 4½ oz. in silver; eight inches of solid ore in the creek gave $48 in gold, 7½ oz. silver, and 4 % lead. The strike of the vein at this point is N. 35° W., and the dip 72° to the S. W.

O. K. Fraction. This fractional claim is owned by Joseph Perrault, of Stewart, and is an extension of the *Little Wonder* claim just mentioned. The "east vein" can again be easily traced along the bed of the creek and on the right bank until Glacier creek is reached, 750 feet vertically below the *George E.* cabin. A number of open cuts show this vein up as strongly as at any point where it outcrops. It is well mineralised with iron pyrites, argentite and native silver, but owing to the presence of native silver and argentite, the values are likely to be spotty. Samples taken by the Government Assayer assayed as follows: gold, 0.1 oz per ton; silver, 75.2 ozs. The *O. K. Fraction* extends across Glacier creek and joins the *Mosquito* claim, owned by the Portland Canal Mining Co., Ltd. Enough work has not been done to definitely determine the width of the vein where it crosses Glacier creek, but it is probably from 10 to 15 feet wide.

Main Reef Mineral Claims. To the northward over the hill from the *Sunbeam* claim, Ranch and Horseman have located the *Main Reef No. 1* and *No. 2*, and the vein seen on these claims may be one of those noted on the Stewart Mining Company's property, as it is in the same line and has similar features. The claims are reached by a trail 1½ miles from the Bear River valley, and are at an altitude of 1,300 feet above Glacier creek camp. A small creek has cut through the rock and shown up a fissure in a slate country rock. A tunnel 33 feet long has been run in on this fissure, which has a strike S. 75° E., a dip of 65° to the south, and is clearly defined, but is mostly filled with crushed slate, slightly impregnated with quartz, but where the quartz is in any quantity, it is heavily mineralised with iron pyrites and a little galena.

Some twisting and perhaps faulting of the strata has occurred along the line of the bed of the creek, as what appears to be the same vein is seen on the opposite bank 250 feet farther up the creek. Here a tunnel has been run in 30 feet on a fissure, which has the same features as noted on the other side, but the strike is S. 25° E. and the dip nearly vertical. A felsite dyke lies along the east side of the fissure.

The owners shipped four tons of ore from this tunnel, which gave them the following returns per ton:—Gold, 0.7 oz.; silver, 20.94 oz.; lead, 23 %. Such returns encourage further prospecting, in the hope that the filling of the fissure may change from crushed slate to ore, which it might do in a very short distance, as the crushing movement noted at this point may be purely local. Samples of galena and pyrites taken by the Government Assayer assayed as follows:—Gold, 0.3 oz.; silver, 51.2 oz.; copper, none; lead, 64.2 %.

Tyee. This claim is owned by Bibeau & McKay, of Stewart, and was formerly the *Mother Lode*. It is situated about a mile above Glacier creek and 300 feet vertically above Bear river. An ill-defined fissure in a granolitic rock,*

* This specimen is a pinkish gray granolitic rock of medium texture. The only minerals distinguishable in the hand specimen are feldspar, which seems to make up the body of the rock, and black specks of some bisilicate mineral. In the thin section it is found to consist of feldspar, quartz and hornblende, and with which a small amount of biotite is intergrown and accessory amounts of sphene. The feldspar consists of orthoclase and of finely striated plagioclase, evidently of the oligoclase-andesine type. The rock is a hornblende-biotite-granite.

about 3 feet wide, is filled with quartz and there are also a number of small stringers of quartz. An open cut 15 feet has crosscut this showing, and another short open cut 35 feet to the S. E. has been run into the ore body. The quartz is well mineralised with iron pyrites and in places a little copper. Samples of the quartz and pyrites taken by the Government Assayer gave rather astonishingly high values, as follows:—Gold, 4.92 oz.; silver, 20.68 oz.

Tomboy. This claim, owned by Sutherland & Thomson, of Stewart, has been located on the main Bear River trail, 7½ miles from Stewart. The claim was only located this summer and a few shots have been put in on a quartz mineralisation in slate, on the left bank of Bear river. The mineralisation is about 8 feet wide and consists largely of pyrrhotite and a little iron pyrites. The assay values are low.

Roosevelt Group. This group, consisting of the *Roosevelt No. 1* and *No. 2*, *Pontiac*, *Miller*, *Northern Bell*, is owned by Rainie & Chambers, of Stewart, B. C., and is situated on Bitter creek, a tributary of Bear river, flowing in from the south-east, nine miles from the head of the canal. Bitter creek is a stream of considerable size, being one of the largest creeks flowing into Bear river, having its source in a large glacier and being also fed by minor streams. The claims are reached by following a trail up the right bank of the creek for five miles, then turning up a small tributary called Rainie creek for 1½ miles. The creek has cut deeply into a slate formation, and in this slate rock is a fissure which is partly filled with a felsite dyke four feet wide. To the left of this dyke is a zone of crushed slate largely impregnated with quartz, carrying iron and copper pyrites, a little galena, and a slight secondary filling of copper carbonate. A tunnel, 90 feet long, has been run in on this showing; for the first few feet quartz predominates and is 4 to 5 feet wide and carrying some values. There are good walls, the dyke forming the one to the right; the strike of the lead is N. 70° W., and the dip vertical. In the drift, 40 feet from the entrance, the quartz vein narrows to 14 inches and is not distinctly seen in a crosscut 8 feet further on, which has been run to cut it. From this crosscut to within a foot or two of the face is a crushed and slicken-sided zone of slate, carrying a few stringers of quartz and calcspar. There is a clean wall on the side of the dyke; the other wall is not so good. The face of the drift shows the same crushed slate zone, but with more quartz coming in. The elevation of the tunnel is 900 feet above the junction of Bitter creek and Bear River, and 1,400 feet above sea-level. The tunnel is on *Roosevelt No. 2*.

At a distance of 650 feet farther down the creek, and 50 feet vertically below the tunnel on *Roosevelt No. 2*, is a similar felsite dyke and crushed slate zone, the latter being filled with quartz and about 4 feet wide. The fissured zone lies in contact with the dyke and has been prospected by a drift 25 feet long. The quartz infiltration does not show up so well or permanently as in the No. 2 tunnel. The mineralisation consists of galena and blende, with a little iron and copper pyrites.

Samples taken by the Government Assayer gave the following returns: Upper tunnel—Gold, .28 gr.; silver, 1.8 oz.; copper, 5.6 %. Lower tunnel—Gold, .08 oz.; silver, 62.8 oz.; lead, 22.4 %; copper, 1.2 %.

Pasco and Independence. These claims are reached by a trail up the left bank of Bear river, and are situated on the left bank about 3½ miles above the junction of that river and American creek. The trail rises to avoid the canyon, but descends to the creek level at the *Independence* claim, which is only about 80 feet higher in altitude than the junction of Bear river and American creek. Some 40 feet back from the creek the rock rises at a high angle, and in this rock there is a vertical fissure which is mineralised with galena and a little copper glance. The rock is slickensided and crushed, and more or less interbanded with the ore. An open cut, 15 feet long, has been run into this

showing, and in the bottom of the cut is a vein of steel galena 10 inches wide, with a further slight mineralisation on either side of it. The mineralised zone appears to pinch out at the top of the cut and to widen at the bottom. The country rock is a fine-grained porphyrite. The strike of the fissure is S. 40° E., and some claims have been staked on what is believed to be a continuation of this fissure, on the opposite bank of the creek, the ore being of similar character. A sample of the galena gave the following assay:—Gold, 0.02 oz.; silver, 30.0 oz.; lead, 70.3 %.

American Creek.

Red Cliff Group.

American creek, an important tributary of Bear river, joins the latter some thirteen miles from the head of Portland canal. A considerable number of mineral claims have been staked on either side of the creek, many of which were only located this year. At the junction just mentioned a small stream flows in from the north-west, named Lydden creek, after one of the early prospectors; half a mile up this creek and 400 feet above Bear river, a group of five claims, known as the *Red Cliff* group, has been located. The names of the claims are *Mount Lyell*, *Red Cliff*, *Little Pat Fraction*, *Montrose* and *Waterloo*, owned by the Red Cliff Mining Company, of Vancouver, B. C., A. D. McPhee being Superintendent at the mine. Lydden creek flows along the base of a bare mountain, which rises with a slope of 55° to a height of about 5,000 feet. On the face of this mountain are easily seen numerous mineral stains having a general trend up and down the mountain. On the strongest of these mineral stains the *Red Cliff* claim was located, and a few shots disclosed a showing of copper gold ore; this has been further prospected by a tunnel in the same place and running directly into the mountain. The tunnel is 400 feet above Bear river and about 160 feet above Lydden creek; it has been driven 57 feet directly into the mountain, the course being S. 35° W. mag. A crosscut of 17 feet was made to the right to cut through a horse which was supposed to come in, but this has been stopped and the tunnel has been pushed 12 feet farther into the hill and is still being run, the total distance from daylight in a direct line being 67 feet.

The tunnel and stripping which has been done show up a body of solid ore, which appears to be some 8 feet wide, but it has not been cut through in any place in the tunnel, the roof and left side being in good ore all the way, the right side of the tunnel being mineralized with iron pyrites without copper, but carrying low gold values. Some shots put in 100 feet above the tunnel show up ore the same as that noted below.

The ore body appears to occur in the form of a vein or veins in a greenstone country rock, the vein matter being a dark igneous rock matter interbanded and criscrossed with small quartz veinlets, the whole being mineralized with iron and copper pyrites; in some places the copper pyrites is in solid bands, five or six inches thick. The assays on this ore vary from 6 to 18 % copper, 0.3 to 1.8 oz. gold and 1.0 oz. of silver, the iron pyrites unmixed with copper pyrites carrying 0.3 oz. in gold, while selected specimens give much higher values.

The walls of the vein are tight; there is little evidence of any movement and none of any secondary deposits or enrichment. There are about 225 tons of ore on the dump.

The position of the present tunnel on the slope of the mountain renders work unsafe for eight or nine months in the year, on account of snow-slides, so the company has surveyed and intends to run a long working tunnel 387 feet lower down the hill, under the ore body that has been proved, which will render the working of the mine possible at all seasons of the year.

To the north-west of the *Red Cliff* is the *Little Pat Fraction*, on which there is a considerable surface showing, which has not yet been touched. Farther to the north-west the *Montrose* claim has been deeply cut by Lydden creek, and in this cut there is an exposure of ore similar

to that seen on the *Red Cliff*, not showing so much copper but carrying high gold values. A mineralised face of some 25 feet square has been uncovered by surface work.

At numerous places on the mountain side mineral stains are to be seen, but its precipitous nature renders prospecting difficult, and in some cases impossible.

Samples from the *Montrose* assayed as follows:—Gold, 6.8 ozs.; silver, 1.2 ozs.; copper, trace.

American Girl Group.

These claims are reached by a trail following up the right bank of American creek and are about four miles from the junction of the creek and Bear river. The trail is a very poor one, the first part of the way being in the bed of the creek, then taking a steep rise to avoid the canyon through which American creek flows it skirts the base of the mountain for the remainder of the distance, and must present at certain seasons considerable danger from snow-slides. The end of the trail zigzags up the face of a slide until the tunnel on the *American Girl* is reached, at an altitude of 2,200 feet, or 1,700 feet above the junction of American reek and Bear river. At the tunnel mouth the rock face is nearly perpendicular for some distance, and on this face a quartz vein some 14 feet wide is easily seen, striking, approximately, S. 60° W. and dipping at an angle of 60° to the south. The tunnel runs directly in the middle of the quartz vein into the mountain, in a S. 80° W. direction, continuing in this direction for 48 feet. At 33 feet from the mouth of the tunnel the vein swings to the left, the tunnel being in country rock; at 48 feet in, the tunnel also swings to the left for 56 feet more, until the last course is S. 20° E. Ore is not again seen until the face is reached, where a stringer of ore a foot wide has been crosscut, the ore being the same as in the main vein, and striking N. 50° W., with a dip of 70° to the south-east.

The vein matter is quartz, showing a brecciated rather than a banded structure, mineralized with blende, galena, stibnite, copper glance and a secondary enrichment of copper carbonates. It is also probable that argentite occurs in places, as high silver values occasionally occur. The country rock near the vein is a trap, although the most of the float from farther up the mountain is a distinct porphorite, mixed with red jasper.

OBSERVATORY INLET.

Observatory inlet is a branch of Portland inlet running practically parallel with Portland canal but fifteen or twenty miles apart. Thirty-five miles from the entrance, Observatory inlet splits into two arms, viz., Hastings and Alice arms, the former heading north and south and Alice arm east and west. Goose bay is a large sheltered inlet, the outlet being on the west shore of Observatory inlet, at the entrance to Hastings arm. While there is a deep waterway of ample width, no detailed survey has been made of these waters and the chart should be used with caution.

Hidden Creek Copper Co.

This company owns nine mining claims in the neighbourhood of Goose bay, viz.: *Rudge*, *Revenge*, *Donald*, *Alpha*, *Manson*, *McKinley*, *Kenneth*, *Salamander* and *Bunker*. The principal work has been done on the *Alpha* and *Revenge*, and there is an excellent plank road two miles long extending from the deep water of Goose bay to the main tunnel, which is 530 feet above sea level.

Prospectors were first attracted by a round-topped hill, about 1,000 feet high, which was more or less covered by a typical "gossan" or iron cap. Prospecting showed that this gossan was thicker and more strongly marked in some places than others, and attention was specially

directed to these points. The first of this work was done on a large exposure of these oxidized ores, which proved to be five feet thick. This gossan was cut with a number of trenches which disclosed a body of mixed pyrite and chalcopyrite ore, and this was prospected by four tunnels, aggregating 200 feet. These tunnels developed a large body of ore carrying 4 % to 6 % copper, which was called the "Cabin Bluff," and is at an altitude of 700 feet.

About 500 feet back round the hill and 200 feet higher than the "Cabin Bluff," another and larger exposure of ore was discovered and named the "Mammoth Bluff." This has been cleared off to a large extent by surface stripping and shows a height of 300 feet of mixed pyrite and chalcopyrite ore, carrying 4½ % to 5 % of copper. This ore deposit has been prospected by several tunnels, in all 350 feet in length.

There are several smaller showings on this hill, and these, with the "Cabin" and "Mammoth" bluffs, have been prospected by 2,000 feet of open cut, besides the tunnels. To tap these ore bodies at depth and form a main working tunnel, a long drift has been started on the hillside 200 feet vertically below the "Cabin Bluff," and when the property was visited this drift was in 732 feet. At 480 feet in, the ore seen in the "Cabin Bluff" above was struck, the tunnel cutting through it, the strike of the ore being N. 10° W., dip 65° W. The thickness of the ore body is estimated at from 25 to 40 feet, running from 4% to 5% copper. Drifts 70 feet long have been run on either side of the tunnel in ore all the way, the direction of the tunnel being 90° from the strike of the ore.

Round the hill to the south 265 feet, and at an elevation of 100 feet above the main tunnel, a drift known as the "Pyrites tunnel" is being run in to connect with an upraise from the main tunnel, For the first 100 feet this tunnel runs through loose granular pyrites, made up of small detached iron pyrites crystals similar to those found on the *Ecstall* pyrites deposit, near the Skeena river. At 100 feet in, solid mixed iron and copper pyrites ore was struck, carrying 4% copper for ten feet, when a lower grade iron sulphide ore was met, and the tunnel is still in this ore at 200 feet from the portal.

The vertical height between the main tunnel and the top of the "Mammoth Bluff" deposit is 450 feet, and with the prospecting done it is reasonable to infer that the ore chute is continuous for this vertical distance. The horizontal boundaries of this ore body have not been clearly defined, but it is probably some 600 feet in length by 20 to 25 feet in thickness, carrying 3% to 4% copper.

At the "Cabin Bluff" showing there is a considerable depression in the ground, which appears to have been caused by the oxidising and dissolving out of the pyrites ore-body, and there is a large deposit of hæmatite in a small flat of ten acres south of the ore showings, where this dissolved out ore has been re-deposited. Samples of this deposit gave the following assay: Iron, 60%; gold, 0.10 oz.; copper, 0.2%.

The country rock in the vicinity of the ore-body is made up of altered argillites or shales, traversed by felsite, diabase and porphorite dykes, these dykes being of later origin than the ore. In some parts of the deposits there is a vein filling of quartz, but the main body is composed of solid sulphide ores.

There is an 87-foot water-fall on a small creek 1¾ miles northward of the main tunnel, where 600 horse-power is developed by an impact wheel of Pelton type. This runs an 8-drill Rand compressor and also a small saw-mill capable of cutting 7,000 feet a day of rough lumber.

Transportation facilities are being provided by the installing of 2,500 feet of gravity tramway and one mile of an electric tramroad on a seven-tenths of one per cent. grade. This will bring the ore to deep water, where it can be shipped to any of the coast smelters.

The property is under the general direction of Mr. M. K. Rodgers, American Bank Building, Seattle.

SUMMARY.

Since the Portland canal district was examined, three years ago, a considerable amount of development work has been done, with results that have been quite encouraging. The veins have proved permanent in character and have given returns which were very satisfactory. The results obtained by the development work done on the *Little Joe* vein serve as an indication of what may be expected by the opening up of other prospects having fissures of a similar character. A number of such prospects have as good surface showings as could be seen on the *Little Joe* three years ago, and there is every reason to hope that, with equal development work, they will become quite as valuable properties.

There still remains ample ground that either has not been prospected at all or only in a very hurried and superficial manner, and the country at the head of Bear river and between Bear river and American creek seems to promise a return for careful prospecting. The districts at the head of Salmon river and Marmot river have also hardly been touched, while much unknown ground lies at the head of Hastings arm of Observatory inlet.

The Government has dealt generously with the district in providing transportation facilities, and the outlook for this section of the Province is such that there is every reason to believe that the faith thus shown has not been misplaced.

QUEEN CHARLOTTE MINING DIVISION.

REPORT OF E. M. SANDILANDS, MINING RECORDER.

I have the honour to submit my annual report on mining operations in the Queen Charlotte Mining Division for the year 1909.

The amount of revenue collected during the past year compares very favourably with that of the year 1908. More assessment work has been recorded this year than last year, but there has been a falling off in the number of claims located, possibly due to the very wet summer and the heavy snowfall of the previous winter, making it late before prospectors could get into the hills. The large number of assessments performed this year, however, rather goes to prove the owners' confidence in their properties.

COLLISON BAY.

On the *Maple Leaf* group, owned by the Collison Bay Mining Company, and under the management of W. H. Parsons, considerable work was done this summer, an average of about ten men being employed. Several hundred feet of tunnelling was run and a shaft sunk, with fairly good results. The mine closed down last November, but will resume operations again shortly.

The *Thunder*, owned by Thompson & Daykin and others, has some fine ore in sight, but not much more than the ordinary assessment work has been done.

The *Iscoyd* group, owned by Simpson & George, is situated at the head of the Collison bay and Huston inlet divide. Considerable work has been performed this summer with very satisfactory results, showing up some fine ore. A cabin has been built.

Ikeda Bay.

This well-known property was worked the first six months of the year and then closed down. Several well-known smelting companies have examined the property with a view to purchase, and at the time of writing a deal is almost closed with well-known mining people. Some 4,000 tons of ore were shipped during the first six months of the year.

Harriet Harbour (Jedway).

On the *Copper Queen* group of claims nothing of any importance has been done; a majority of the other claims have been Crown-granted, and now that all litigation is over, work will be prosecuted vigorously this coming season.

Huston Inlet.

On the *Ivan* group, situated at the head of the Huston inlet and Collison bay divide, and owned by Thompson & Mackinnon *et al.*, considerable work has been done this summer, showing up some fine ore.

On the *Hercules* and *Morning* claims, owned by McEachern & Jones, some very good ore was discovered, that on the *Morning* carrying good gold values.

Copper Islands.

The *Skincuttle*, situate on Copper island and owned by Mr. Heino, shipped about 10 tons of copper ore.

On George island, J. Campbell lately found some very fine ore; at present very little work has been done.

Gold or Mitchell Harbour.

The *Early Bird* group, situate at Gold harbour, on the west coast of Moresby island, and lately under bond to the Nuba Mining Company, was closed down this year and the property reverted to the owner, J. McLellan, who has now taken it over, has purchased a small stamp-mill, and will vigorously prosecute work this coming summer. The ore contains free-milling gold.

Lockeport.

Considerable work has been done on the *Swede* group of claims, which is under bond to J. Wulffsohn. This past summer the two tunnels were both driven ahead, and now ore is showing in the face of each. Another tunnel has also been started higher up the mountain.

The *Hawk's Nest* group is situate on Tal-un-kwan island, and is owned by E. A. Hemming, of Vancouver. There are two tunnels on the property from which zinc blende has been obtained, carrying very good gold values. There is also a large deposit of low-grade copper ore. The claims have been surveyed and Crown grants applied for.

With the exception of the annual assessment work, no work of any importance has been done on the *Apex* group.

The claims comprising the *Morgan* group have been surveyed and certain assessment work accomplished. Good cabins have been built and development on a larger scale will be proceeded with this coming summer. The property is owned by the Windy Arm Mining Syndicate.

On the *Last Chance* group two tunnels, 28 feet and 12 feet respectively, have been driven; the first shows ore all the way in to the present face and the second is also in ore.

On the *Bird* group, consisting of seven claims, owned by Langan and Gill, considerable surface work has been done, disclosing some very fair showings of ore. Next summer permanent camps will be erected and more work done.

Tassoo Harbour.

The *Contact* group is situate in the south-east arm of Tassoo harbour and is under bond to A. B. W. Hodges and others, of Grand Forks. Considerable open-cut work was done this summer, tracing the outcrop, but so far no underground work has been undertaken. In the spring permanent camps will be built on the property and work begun.

On the *Warwick* group, owned by Elliot & Corlett, considerable work has been accomplished, buildings built, trails made, etc.; an average of about fifteen men being employed. The upper tunnel is in over 200 feet, showing ore all the distance with the exception of two or three small "horses" of lime. The greatest depth from surface to face of tunnel is 80 feet, the deposit being traceable for over three claims.

Cumshewa Inlet.

The *Homestake* group consists of three claims, situate at the mouth of Cumshewa inlet, and was recently sold to an English syndicate by Topping & Johnson. Good showings of galena, carrying gold values, have been struck, camps have been built, and about four men employed; more extensive work will be done this summer.

Adjoining this group, Collier and Kilpatrick have some very promising claims.

Graham Island.

On North island, situate on the north-west corner of Graham island, some ore carrying gold, silver, and antimony has been discovered. Work will be done on these claims this coming summer and trial shipments made. Jones *et al.* are the chief owners.

Hydraulic Placer Leasing.

On the north-east coast of Graham island, near Cape Fife, considerable work has been done on the beach deposits of black sand, in the way of sluicing, etc., and very favourable results have been obtained.

Fifteen hydraulic placer leases have been granted and work on a larger scale will be carried on next summer. Sluice-boxes and a small gasoline engine have so far been the only plant at work on the claims.

Coal.

According to reports the coal-drilling around Masset inlet has proved very encouraging. There is quite a lot of excitement over the coal on Graham island.

Trails.

The trail from Sewell inlet to Tassoo harbour has been improved and was corduroyed. This fall a couple of cabins were built at either end of the trail to shelter the freight while on the portage, and these have already proved a great benefit.

The trail up Huston inlet has been improved; also the one at the head of Collison bay from salt water.

The trail from Jedway to Ikeda bay has also been put in much better shape. A trail has also been built from Lockeport into camp at Cannon's, on Tassoo harbour, *vid* Morgan's camp.

SKIDEGATE INLET, QUEEN CHARLOTTE ISLANDS. Looking west from Skidegate.

Office Statistics—Queen Charlotte Mining Division.

Free miner's licences issued	251
Claims located (quartz)	226
" (placer)	9
Hydraulic placer leases issued	14
Certificates of work issued	484
Bills of sale, etc., recorded	167
Certificates of improvements issued	9

Revenue.

Free miner's certificates	$1,398 25
Mining receipts	3,961 40
Other sources	737 00
Total	$6,096 65

QUEEN CHARLOTTE ISLANDS.

Notes by the Provincial Mineralogist.

On June 23rd the Provincial Mineralogist left Victoria for Skidegate, travelling directly to that point on the steamer "Princess Beatrice"—thanks to the courtesy of Messrs. Phipps, of New York, who had the steamer under private charter. Skidegate was reached on the evening of the 25th, and a gasoline launch chartered for a trip around the west coast of Moresby island.

On Monday morning, June 28th, accompanied by Mr. H. Nation, the Provincial Mineralogist started from Skidegate in the launch "Wee Jeannie"—a boat 33 feet long and drawing 4 feet of water—and sailed westward through Skidegate channel to the west coast of Moresby island, following the main channel, then, turning southward around Chena point, skirted the coast-line south to Inskip channel, and, passing in to the north of Kuper island, followed the inlet to its inner end—a small arm known as Mitchell or Gold harbour—a run of about nine hours by this launch, which is supposed to have an average speed of eight miles an hour; here anchor was cast off-shore from the historic gold-mine worked in the early 50's by the Hudson's Bay Company.

Skidegate inlet is navigable for ships of any draft as far westward as the Narrows, although the entrance to it from Hecate strait is rendered complicated by an extensive sandbar extending northward for many miles from the Spit, the north-east point of Moresby island, over which, except at high tide, a sloop cannot pass with safety. The main or deep channel is thus forced to the northward, more or less parallel with the east shore of Graham island, for five or six miles. The point of the sandbar is now marked by a gas buoy, and the entrance, when understood, can be made by the largest coasting steamer with certainty and safety at all times. The shores of the inlet are not high, rather rolling hills, densely covered with timber of excellent quality.

Near the entrance to the inlet there are a few settlers on the south, or Moresby island, side, while on the north or Graham island side is the Indian village of Skidegate, where smaller supplies can be obtained and boats and boatmen can usually be had at any season, other than the salmon-canning season on the Skeena river, to which place nearly the entire population moves every year. These Indians, a remnant of the once powerful Haidas, are excellent sailors and canoemen, capable of doing good work, but apt to be "pretty independent" when they return from the fishing season, with a supply of money, which to them seems inexhaustible.

The town of Skidegate—the old oil-works—is, and has been for many years, a supply point and post-office, where the usual supplies for camp use may be obtained, and recently very comfortable hotel accommodations have been provided by A. Smith.

Some four miles westward along the northern shore from Skidegate a new townsite has been laid out, known as "Queen Charlotte City," and within the last couple of years there have been established there a sawmill, hotel, drug-store, and newspaper office, as well as a number of residences.

Near Queen Charlotte City a trail starts inland, leading to the coal-exposures on Graham island in the vicinity of Yakoun lake, which coal-measures continue south to the waters of Skidegate inlet, and are also found to the south of the inlet, on the north end of Moresby island, over a limited area, in which coal has also been located.

These coal-exposures on Graham island have been known and held for many years and have been the subject of a previous report by this Bureau, and also by the Geological Survey of Canada, therefore a passing mention is all that will now be made.

After lying practically dormant for many years, these coal-deposits have again had attention drawn to them by the general development of the northern coast of the Province and its demand for coal. These coal-areas are held under old Crown grants, which also give possession of the land and timber, the latter being exceedingly good. It is understood that the areas have now passed from the original owners into the hands of a timber firm, or syndicate, which has taken some steps towards developing the coal-deposits, either directly or through other parties to whom the coal has been bonded.

One or two parties of possible investors in the coalfields examined them during the past season, as far as could be done from the several slight developments opened up. These developments are apparently enough to encourage further investigation in the way of a systematic series of borings to be put down in the flatter lands lying to the east of the outcropping towards which the coal dips.

At the Narrows, the volcanic rocks which form the western boundary of the sedimentaries or coal formation of Graham and Moresby islands cross the inlet, and, their harder nature having resisted erosion, they form the Narrows, with its steep, rocky reefs, etc., which serve as an effective bar to navigation for boats of any size, although sailboats and launches can get through even at low water, if one possesses an intimate knowledge of the very tortuous channel; otherwise it is impossible. The tides from Skidegate inlet on the east and from Skidegate channel on the west meet at the Narrows and, receding, ebb both ways from this point. It is consequently desirable, when making the passage, to reach the Narrows at slack high tide, both on account of the depth of water then and the assistance of favouring tides both ways, which are so strong in these narrow waterways that it is impracticable to oppose them.

The mineral development along the shores of Skidegate inlet and channel is slight; the coal formation has been already noted. On the Graham island shore some attempt was made in the 60's by the Queen Charlotte Mining Co. to mine coal, near the entrance to Long arm, at the Cowgitz mine and the No. 2 mine, where a 6-foot seam of coal was developed; mining was, however, subsequently abandoned. These properties and the coal formation here exposed were described by James Richardson in the Report of the Canadian Geological Survey for 1872, and later by Dr. George Dawson, in the Report of 1878-79.

On the Moresby island shore, coal-areas were located and coal-croppings discovered near the Narrows, on which some slight development work was done three years ago by Captain Oliver, but, as far as is known, the work was not continued last year.

On Slate creek, near the coal-bearing black shales and close to the volcanic rocks, there is a slate-quarry, from which the Indians have been in the habit of quarrying a black slate, soft enough to be sawn with an ordinary hand-saw, and from which they carved pipes, totem-poles, etc., which take a beautiful polish and are of a rich black colour. It has been thought by investigating prospectors that the quarry had possibilities as a source of slate for mantels and other uses of civilisation, and attempts have been made to stake it. This slate has been described by Dr. J. D. Harrington, in James Richardson's Report, as of "a greyish-black colour upon fractured surfaces, and black when polished. The rock has a hardness of 2.5 and a specific gravity of 2.88; it decrepitates with considerable violence when heated and becomes a reddish-grey colour, the carbonaceous matter being burned off. It is a hydrated silicate of alumina and iron, with several per cent. of carbonaceous matter."

The following is an analysis by Dr. Harrington of this slate-rock :—

Silica	44.78
Alumina	36.78
Peroxide of iron	8.46
Lime	Trace.
Manganese	"
Water	7.15
Carbonaceous matter	3.18
	100.35

No very important discoveries of metalliferous minerals have as yet been made on the shores of Skidegate inlet, but at the Narrows the rock formation is the same as seen near Lockeport, at the *Swede* group mines, and here this has also been found to be copper-bearing. This formation has been somewhat prospected and a number of claims staked on exposures of copper-bearing veins, but as yet no ore has been discovered that could be profitably worked.

Passing westward from the Narrows to Skidegate channel, the passage to the north of Chaatl island was taken, as the southern passage—Canoe passage—is too shallow for anything larger than a rowboat; it is, however, much used by small craft, since by this route the rounding of the north-west point of Chaatl island, a rough, rocky point upon which a heavy surf usually breaks, is avoided. The entrance to Skidegate channel from the west is good for even very large vessels, as there are few sunken rocks, but to the north of the channel the west coast of Graham island is extremely dangerous, as sunken, rocky reefs occur as far out as Limestone islands, and vessels must therefore round these islands to the south and west.

The west coast of Moresby island presents a face of high, rocky cliffs, usually rising precipitously from the water's edge, with little or no beach, while off-shore, for some hundreds of yards or more, ugly-looking black rocks show through the water or are awash with the surf, which is always to be found on this coast, exposed as it is to the full sweep of the Pacific ocean. It is almost impossible to make a landing anywhere on this west coast of the island, it is so rough and wave-swept, and the coast deserves the name it has of being the most inhospitable and forbidding on the Pacific. The coast-line and adjacent waters are quite uncharted—in fact, the charts are so incorrect as to be misleading.

At first glance the coast looks as if no shelter was to be had anywhere, but on closer examination the apparently solid line of rocky mountains facing the ocean is found to be pierced about every five miles by narrow openings, frequently leading to extensive and sheltered harbours behind the first range of hills. These openings, though rock-bound and narrow, have deep water, and a mariner having the local knowledge and sufficient "nerve" to approach the forbidding coast can run in from any storm between rocky walls into a quiet and sheltered basin.

The entrance into Inskip channel is particularly forbidding, a large black rock occupying the centre of the opening, but having a good deep channel on either side. On the north side of the channel there is a small area of comparatively level land around the ancient Haida village of Kaisun, long since abandoned and now overgrown with brush, its site and ancient importance being affirmed by the numerous large and beautifully carved totem-poles, mute evidence of the greatness of a passed race. Back of the village the mountains to the north rise abruptly to a height of 2,000 feet, forming an excellent shelter from the north winds.

On the north side of Inskip channel, about three miles in from the ocean, a narrow arm known as Security bay runs off to the north for about four miles, at the inner end of which is a cabin, from which a trail nine miles long has been cut to Skidegate narrows. This trail has been much used by the prospectors working on Inskip and Moore channels as a route to and from the base of supplies at Skidegate, since, particularly in the fall and winter, the seaward passage is impracticable for small boats, sometimes for a month or two.

Between Inskip channel on the north and Moore channel on the south lies Kuper island, an island about ten miles long, a mountain of igneous rock with little or no level land, covered with timber and surrounded by deep water.

At the inner or eastern end of Moore channel are three arms, the innermost, Mudge harbour, being about two miles long, uncharted, and practically unknown. The middle one, Mitchell or Gold harbour, was the scene, in 1852, of gold-mining operations carried on by the Hudson's Bay Co., which sent up a party of men in the brig "Una," under Captain Mitchell. The inner end of Gold harbour is known as Thetis cove, named after the survey ship H. M. S. "Thetis," which visited and surveyed the cove and neighbouring waters in 1852. The third harbour is called Douglas harbour; it lies parallel to Gold harbour, about a mile to the westward, along Moore channel, and is some two miles long, in a south-east direction, and and half a mile wide.

Gold Harbour.

The discovery of gold at Gold harbour would appear to have been originally made by the Indians, since it was pieces of gold in their possession that excited the curiosity of the Hudson's Bay Co.'s traders, who induced the Indians to disclose the source, and this led to the prospecting expedition under the auspices of the Hudson's Bay Co. in 1852. The accounts of the results of this expedition vary in proportion to the imagination of the narrators; some accounts imply that boatloads of quartz held together by gold were blown into the sea by the injudicious use of powder. The most authentic account is by Major William Downie, a miner, who, in 1859, heading a party of twenty-seven men and provisioned for three months, attempted to again work the property; he places the value of gold recovered at $5,000. The result of this expedition is given by Downie in his book "Hunting for Gold." He "examined the spot where a large amount of gold had been taken out some time before (seven years), but could not find anything worth working." The present writer examined this spot on June 28th, 1909, and found where the excavations had been made. Here, on a small peninsula, a trap dyke was found cutting through a diabase country rock in a N. 45° W. direction, with a nearly vertical dip. Following alongside the dyke is a crushed zone about 2 feet in width, in which occurs a small vein of quartz from 1 to 4 inches wide, somewhat irregular but quite persistent. The quartz is frequently quite crystalline and, in cavities, presents some very perfect crystals; accompanying the quartz is a considerable amount of crystalline calcite. The quartz now visible carries very small particles of free gold, though not in sufficient quantity to form a profitable enterprise. The work done consists of an open trench a couple of hundred feet long.

McClellan's Claim.

The legends of this old property induced investigation by prospectors, and almost three years ago John McLellan, an assayer and prospector, after testing the old mine without satisfactory results, prospected in the vicinity, and within about 100 yards distance discovered a new vein, which he staked, and on which there has since been done a considerable amount of development. The McLellan vein was found outcropping on the rock between high and low water, and has been traced inland by workings for some distance. In character it appears to be similar to the old Hudson's Bay Co.'s mine, following along in a general fissure of crushing, about 3 feet wide, the quartz veinlet varying from a stringer up to several inches, the average width being estimated at about 2 inches; the strike of the vein is very nearly N. and S. (mag.), with a nearly vertical dip. The courses of the two veins would intersect, but the intersection would be under the harbour. The underground development consists of about 176 feet of tunnel, 57 feet of cross-cutting and 80 feet of raise and winze.

The tunnel starts a few feet above high-water mark and follows in on the vein in a southerly direction; at 45 feet in a winze has been sunk for 60 feet below the level of the tunnel, and above it is a raise of 20 feet to the surface. At 117 feet in a cross-cut has been put off to the west for 27 feet, from which a drift extends in a southerly direction. At about 35 feet from the inner end of the tunnel a cross-vein, running about N. 25° W., joins the main vein, and on this the tunnel has followed. The same thing is apparent on the surface in open cuts, which have developed the vein for a distance of nearly 300 feet.

The quartz vein, although small, contains innumerable specks of free gold, no difficulty being experienced in finding it in any part of the vein exposed. No general sample of the vein was taken for assay, as it was so evidently rich. The owner has found portions of the vein richer than others and has taken out a number of tons of rich ore, but, of course, at a heavy expense of mining, the vein being so small.

Mr. McLellan erected a home-made arrastra on the ground, driven by water-power, with which primitive apparatus he has managed to extract from some of the richer ore several thousand dollars' worth of gold. In 1909 the property was being operated under a bond by the Nuba Mining Co., but no work was in progress in the latter part of June, and the bond has since expired.

A sketch of the workings is given herewith. There have been erected a log cook-house, a bunk-house, blacksmith shop, and a store and office building.

In the fall of 1909 Mr. McLellan purchased and had shipped up a small stamp-mill, which will be erected on the property during the summer of 1910.

Some prospecting has been done on the shores of Douglas harbour, and it was reported that a prospector had discovered a very promising quartz-ledge there, but as no one was working in that section, it was hopeless in the time available to try to find the place.

June 29th.—Leaving the mine at Gold harbour at 8.40 A.M., a run of about an hour and a half brought the launch abreast of Cape Denham, at the entrance of Moore channel. Turning south, the coast-line presented an unbroken line of rocky cliffs with outlying rocks, the mountains rising abruptly from the shore-line, leaving few, if any, beaches upon which even a rowboat could be landed safely, and absolutely precluding travel on foot along the shore.

Some six miles south-east of Cape Denham the wall-like coast-line is broken by Gawi inlet (erroneously called Kootenay inlet by some prospectors), which extends inland for three or four miles and into which a steamer could run with safety. The promontory forming the southern boundary of this inlet is Cape Henry, a prominent point visible from Cape Denham.

From Cape Henry, for six miles farther to the south-east, the coast-line is similar in character, and unbroken, until the entrance to Tassoo harbour is reached. The coast-line mountains seem to reach their greatest height in the vicinity of Tassoo, the mountain forming the south side of the entrance to Tassoo harbour, Mt. Moody, being about 3,000 feet above the sea, from which it rises a precipitous rocky mass. The entrance to the harbour is invisible as approached from the north, until it is abreast, as the northern side projects farther west and masks the entrance, but makes it easily found when approached from the south. The entrance itself is only about 1,500 feet wide, a narrow channel half a mile long, with rocky, precipitous shores and very deep water right up to the base of the cliffs. That the depth must be very great is indicated by the fact that the tide-flow through this narrow channel is never so great as to prevent navigation either way by a small boat, and yet the area of the harbour from which the tide must ebb is approximately eighteen square miles. After passing in through the entrance the harbour opens out rapidly, extending inwards, easterly, for about six miles, with a width, to the main harbour, of from three to four miles; an arm extends to north-west about two miles, while to the south there are two arms—South arm and Botany bay—each about three miles long.

The west coast route to Tassoo is perfectly feasible in spring and summer, even for small sailboats and launches, and by this route all heavy supplies are brought in, but the prospector and others, travelling light, usually come overland by trail from the east coast of the island. There are two or three trails in use, probably the best one being that starting from the head of Sewell inlet, on the east coast, and running to the head of the North arm of Tassoo harbour, crossing over a low summit, not more than 400 feet above sea-level, and only about four miles long from salt water to salt water. The trouble with this trail is that it starts from nowhere and ends nowhere; for while there is a rough cabin at each end, boats are necessary at both ends to get anywhere, so that it cannot be used unless arrangements are made beforehand for boats. The Government has built a trail from Barrier bay, on the east side of the main Tassoo harbour, over a low pass, to the head of Crescent inlet on the east coast, from which a boat can be taken to Lockeport, or a trail along the shore be followed to the same place. The prospectors working at the head of Botany bay have a trail of their own from that point, over a pass 2,000 feet high, leading to Lockeport.

There has been a good deal of prospecting carried on for the past couple of years on the hills surrounding the harbour, and this work has met with some degree of success on the two southern arms, and a large number of claims have been located. On these, as yet, very little work has been done, beyond a few open cuts, with the exception of a group of claims located on the west side of the upper part of the South arm—that is, on the eastern flank of Mt. Moody.

Tassoo M. & S. Co.

This group is reported as covering some seventeen claims and is being prospected under a bond by the "Tassoo Mining and Smelting Co., Ltd.," the operations being under the local direction of Mr. Elliott, a lawyer from Revelstoke, who had some twelve to fourteen men at work. The claims pretty well cover the hillside from the small bay, upon the shore of which a townsite has been located, northward to the entrance of the harbour. There are exposed upon the surface of the claims a number of bodies of magnetite carrying quantities of iron and copper pyrites. Some of these exposures are of considerable superficial area, and on one of the largest, at an elevation of some 1,300 feet above the sea, the company's development work has been concentrated.

On July 1st, 1909, in addition to numerous open cuts and strippings of the ore-body, a tunnel was being driven in and had then reached a length of from 20 to 25 feet, demonstrating a large and comparatively solid body of magnetite, in which were to be seen numerous small

stringers of sulphides of iron and copper, which in places assumed larger dimensions and from which some very pretty samples of sulphide ore were obtainable. These sulphides seemed to be widely disseminated throughout the mass of the magnetite, and no considerable concentration was noticed. A general sample, taken of the faces exposed in the tunnel and open cut adjacent thereto, gave, upon assay, not over 2 per cent. copper, with but a trace of gold and silver. The management reported having obtained values in gold and silver upon certain samples, and although none of the samples taken by the writer confirmed this, it seems possible that gold might be found in certain parts of the deposit, for the reason that the geological formation and the deposits here strongly resemble the deposits at Ikeda bay, in which gold is shown in the smelter returns of the ore smelted.

Franklin Claim.

The point of land lying between the South arm and Botany bay rises abruptly from the sea at an angle of about 40°, and most of this point has been covered by mineral locations on which, as far as could be found, very little development work has as yet been done. At the time of the visit none of the prospectors were in the camp, and the only development that could be found was on the *Franklin* claim, said to be owned by a Mr. Kitson, where, at a height of about 250 feet above the sea, open cutting and stripping have exposed a considerable body of magnetite carrying a small percentage of iron and copper pyrites. A sample taken from exposures gave, upon assays, about 1 per cent. copper, with trace of gold and silver.

On the east shore of the South arm Rand McDonald has located a number of claims, but had not then developed them enough to form any idea as to what they might contain; the mineral so far developed was iron pyrites with very little sign of magnetite. A cabin has been built on the property and it is proposed to continue work during the winter.

On the south shore of the same arm, near its head, but high up on the hills, the *Hercules* group has been staked but not yet developed.

Contact Group.

High up on the hills, some 2,500 feet above sea-level to the west of the southern end of Botany bay, a group of seventeen claims, known as the *Contact* group, had been staked and was then held by A. B. W. Hodges and associates, together with Frank Fritz and O'Connor. A party, under the direction of H. B. Cannon, had been sent in to do some development work on the property; Mr. Cannon was seen at Botany bay, and he said that the snow was then, on July 1st, so deep on the claims as to render any serious work impracticable, and he had not moved up the hill, although he had two men prospecting up there. It appears that the snowfall during the winter of 1908-9 was unusually heavy and the spring of 1909 remarkably late, so that this year snow lay on all the higher locations until well on into July, a thing previously unknown. For this reason it was decided to be impracticable to examine personally these claims or those of *Apex* camp. The ore of the *Contact* camp, as shown by samples, would appear to be magnetite, carrying sulphides of iron and copper with some arseno-pyrites, and, according to Mr. Cannon, the ore carries appreciable values in gold.

Apex Group.

The mountains rise abruptly from Botany bay to the summit between the east and west coast watershed, and on this summit the *Apex* group is situated. The properties in this camp are at present reached by a more gradual trail from Lockeport, but it would seem from their location that when ore in quantity has to be shipped, it would be more economical to ship it from the Tassoo harbour side, which might be reached by aerial tramway. For this reason this group is mentioned here as a tributary to this district.

July 2nd.—The launch, with the party on board, left the townsite of Tassoo at 4.15 A.M., and by 5 o'clock was in the open ocean again heading southwards along the coast, which near Tassoo is composed of high mountains rising from the water's edge; but as one proceeds south the mountains become smaller, until, near the south end of Moresby island, they are only hills, with the higher mountains farther inland.

At 7.30 A.M., almost ten miles south, the mouth of a good harbour was passed, which, although not entered, evidently afforded good shelter; this harbour is unnamed. The coast scenery of the whole of this west coast is magnificently grand, and must soon attract tourist travel. In the proper season this trip can easily and safely be made in a small boat or launch, but in the fall and winter the west coast is no place for any but the stoutest craft, and then only when in charge of a competent man acquainted with its harbours.

At 7.55 A.M., almost thirteen miles south of Tassoo, another harbour was passed, having a narrow entrance but opening out wider inside; this harbour is almost opposite Skeat harbour, on the east coast of the island.

At 9.10 A.M., almost twenty-three miles south of Tassoo and about three miles from the southern end of Moresby island, a large wide-mouthed bay extends inland in a nearly northerly direction for a couple of miles. This bay is opposite Huston inlet, on the east coast of the island, and is only separated therefrom by a range of mountains about 3,000 feet in height.

At 12.30 the south end of Moresby island was reached, off which lies Anthony island, about a mile long, rising precipitously to the west, or seaward, but with a good sheltered beach on the eastern side, where is situated the ancient Haida village of Nin-stints. The passage between Anthony island and Moresby island, while wide and deep, is so studded with rocks, some partly submerged, that it should be avoided by all boats and the main channel to the south of Anthony island taken; this southern passage is well charted and leads into Rose harbour, a harbour much frequented by sealing-schooners on their way north. The passage from Rose harbour eastward through Houston-Stewart channel, while navigable for large vessels, is intricate, and needs to be well known before it can be traversed with safety.

Danger rocks, off the south-east end of Moresby island, were passed at 3.30 P.M., and after some slight delay, occasioned by a suddenly appearing fog-bank, which necessitated anchoring in Carpenter bay for a half-hour, Ikeda bay was reached at 5.15 P.M., the actual running-time from Tassoo harbour being just twelve hours and the distance about ninety miles.

Landing at the excellent and substantial dock built by the Ikeda Bay Mines Co., the Provincial Mineralogist proceeded at once to examine the mine and to make inquiries as to the circumstances surrounding the death of the foreman of the mine, Mr. Joseph Marco, who was killed the preceding May; a separate and full report of this accident has been made to the Department.

Ikeda Bay Mines.

This group of claims, located about the year 1906 by the Japanese firm of Awaya, Ikeda & Co., of Vancouver, and since operated by the firm as a producing mine, has been already described in detail in the Report of this Bureau for 1907.

The *Lily* group consists of eight claims, and the mining has been so far confined to the *Lily* claim. The underground development is by means of four adit tunnels, Nos. 1, 2, 2½ and 3, the last being now in some 940 feet, ending in a large chamber 50 x 40 feet, from which a large tonnage of good ore has been removed. The ore-body encountered in this chamber is apparently not on the same vein as was followed in by the tunnel, and on which ore was encountered at several places, but lies some 65 feet to the north and was found by a crosscut tunnel from the main tunnel. The Nos. 2 and 2½ tunnels are above No. 3, and each of these

TASSOO HARBOUR, WEST COAST MORESBY ISLAND. Looking westward towards outlet.

has been driven in about 350 feet. The No. 1 tunnel is some distance up the hill and served only for prospecting purposes. The property shipped during the years 1907-08 approximately 8,000 tons of ore, consisting of magnetite carrying copper pyrites mixed with diorite and quartz gangue matter, which gave smelter returns of about $2.25 in gold, 2.2 ounces in silver to the ton, and 4 % copper. The returns for 1909 have not as yet been received. When visited the property was not working, and it was understood that it was under bond of sale to a Provincial smelting company.

On July 3rd the launch left Ikeda bay at 9.30 A.M. and reached Collison bay at 10.35.

Collison Bay Mining Co.

The Collison Bay Mining Co., under the management of Mr. W. H. Parsons, was operating a group of five claims, the *Black Prince*, *Mine Fract.*, *Kenora*, *Office Fract.*, and half of *Shamrock* M. C., employing a force of nine men. The mining operations were being carried on about half a mile from the shore, on the eastern flank of a low hill which runs north-east, where, at an elevation of 500 feet, a prospecting tunnel, known as the Gordon tunnel, has been run in for some 10 to 15 feet, on the dump in front of which lay a pile of ore that assayed about 4 % copper, and which, in the sample assayed in the Government Assay Office, did not carry appreciable quantities of gold or silver; the management, however, reports having obtained assays showing as high as $20 in gold. Some little distance farther down the hill No. 1 tunnel has been driven in on a crosscut for 90 feet, when it cut the vein seen in the Gordon tunnel at 10 feet in. A short drift had been made to the right of the crosscut tunnel, and a drift of 140 feet made to the left, from the end of which an inclined winze was down some 80 feet. In this drift, near the top of the winze, and in the winze, there was a considerable showing of copper pyrites, iron pyrites, and pyrrhotite which might be mined to produce ore of about 4 % copper. A separate sample of the pyrrhotite was taken for assay and was found to be practically devoid of copper, gold, and silver. The vein being prospected dips into the hill to the west and there are indications of other parallel veins to the westward, so it is proposed, should the development prove satisfactory, to continue the crosscut tunnel westward through the hill, a calculated distance of about 1,100 feet, and eventually to ship all ore from the western side end of this tunnel, down a small parallel valley, a distance of about half a mile to good deep water.

On the afternoon of July 2nd Harriet harbour was visited, and a call made at the office of the Gold Commissioner and Mining Recorder of the District, Mr. E. M. Sandilands, opposite the town of Jedway.

There are a number of claims staked on the hills to the west of the harbour, which were fully described in the Report of 1907, since when no important work has taken place, and the more important claims held by Mr. J. S. McMillan, of Seattle, were found to be in charge of a watchman, no work having been done on them this past year.

The camps at Collison bay, Ikeda bay, and Harriet harbour are all connected by telephone, erected by the persons interested, which has proved a very great help and safeguard to these otherwise isolated camps. Communication between these camps is naturally by water, greatly facilitated by the possession by each camp of one or more gasoline launches, but in stormy weather this avenue is cut off, as the passage around the headlands is dangerous for small boats; consequently, the Provincial Government has had trails cut over the intervening hills, connecting each of the camps. Huston inlet, the next inlet west of Harriet harbour, and the Copper islands, lying off the entrance to Harriet harbour, both noticed in the Report for 1907, were not visited, as it was learned that no important development had taken place there since they were last reported upon.

The next day, July 4th, being Sunday, and the crew having scruples about working on Sunday, it was decided to make the run to Lockeport during the night of the 3rd ; so Harriet harbour was left at 8.30 P.M. and Lockeport reached at 2.45 A.M. the next morning, and anchor cast opposite the town. July 4th was spent at Lockeport and the *Swede* group visited.

Swede Group.

This property was described in the 1907 Report, since when the property has been under bond to Mr. Johann Wulffsohn, of Vancouver, who has done a certain amount of work on the property, consisting of a main tunnel driven directly into the hill for a distance of 130 feet, from which, at a distance of 30 feet in from the mouth, a drift has been run to the right for 30 feet. The diabase country rock driven through by the tunnel shows mineralisation all the way, varying in strength. A barren dyke was encountered which the owners of the property, Messrs. Pearson, Larson & Rogers, have now driven through and proved to be only a few feet in thickness. Beyond this dyke the mineralisation is quite as strong as that found before reaching the dyke.

About 60 feet to the east of the main tunnel a second tunnel has been run in for about 30 feet, which also showed that the mineralisation continued into the hill. The property certainly contains a very great amount of rock mineralised with copper pyrites, much of which is too low grade to be mined at a profit, but it seems probable that development will demonstrate a large tonnage of ore that will eventually stand treatment and mining charges. The ore is admittedly very low grade, running not over 2 per cent. copper, on an average of a large lot, with very small gold and silver values. The analysis of a sample of the ore made by one of the smelting companies was about:—

Siliea	45 %
Iron	10 "
Lime	6 "
Alumina	17 "
Magnesia	5 "
Sulphur	4 "

Messrs. Pearson, Larson & Rogers had located another property, the *Albia*, a few miles to the west, consisting of an oxidised iron capping on top of a large deposit of pyrrhotite. In the capping material they reported that they had been able to pan out free gold, and the presumption was that the oxidised iron was the result of the surface decomposition of the pyrrhotite, to which end a sample of the pyrrhotite was taken and assayed at the Government laboratory for gold, but it was found not to be present in determinable quantity. A second and more general sample of the straight pyrrhotite was later taken by the owners and sent down for assay, and on being assayed gave similar results.

On the north shore of Cumshewa inlet Col. Topping and associates have recently located three claims, which have since been somewhat developed, and which are described by one of the parties interested as having a small but exceedingly rich vein, some 6 inches wide. A sample of some 500 pounds of zinc and iron sulphide ore assayed as high as $400 to the ton, chiefly in gold.

The *Old Shaft* at Copper bay, on the east coast of the island, north of Cumshewa inlet, mentioned in the 1907 Report, was found to have been abandoned during the past year, so the place was not again visited.

On Monday, July 5th, the launch "Wee Jeannie" left Lockeport at 4.40 A.M., and arrived at the town of Skidegate at 1 P.M., where comfortable quarters and a hot bath were obtained at Smith's Hotel.

July 6th was spent at Skidegate, waiting for the C. P. R. steamer "Amur," bound for Prince Rupert.

John McLellan, a B. C. assayer, has just staked a number of claims within a mile or so of Skidegate, on which he subsequently reported that he had obtained ore carrying satisfactory assays in gold, in a sulphide ore.

July 7th, the "Amur" arrived at 6.30 A.M., and the writer and his assistant left for Prince Rupert, arriving there on the same day at 9 P.M., sailing the next day at 7.30 P.M. on the "Rupert City" for Victoria, which was reached on the evening of the 11th July.

OMINECA MINING DIVISION.

Report by W. Allison, Gold Commissioner. (Office at Hazelton.)

I have the honour to submit my annual report as Gold Commissioner for the Omineca Mining Division for the year ending 31st December, 1909.

Placer-mining.

The Omineca Mining Division embraces a large territory which has heretofore produced only placer gold, found chiefly in the vicinity of Manson and Germansen creeks, and these old camps are still being operated, with, in some instances, satisfactory results.

The Kildare Mining Company employed during the past season a force of about twenty men on development and prospecting work, and is reported to have cleaned up in the neighbourhood of $10,000 in coarse gold.

The Ingenika District, over which considerable excitement was worked up last year, has not developed into a camp of any importance. A number of claims were prospected and worked there this past season, but I cannot ascertain that gold in paying quantities has yet been found, and, so far, reports received are not encouraging. On McConnell creek, the Jansen Bros. sank a shaft 196 feet deep, but even at that depth bedrock had not been reached.

Lode-mining.

The district has heretofore been lacking in any means of transportation that would permit of lode-mining being carried on, but now that a railway through the district is assured, and publicity is given to the district, through the construction of the Grand Trunk Pacific Railway, a large number of settlers and miners are flocking in, and from present indications we may reasonably expect a considerable development of the mineral resources of the district. A great deal of prospecting has been going on for several years past in that portion of the Division which is directly tributary to the line of the railway as it is laid out, but the area thus investigated is but a small portion of the total area of the Division, and the high cost of transportation and supplies has served as a deterrent to prospectors wandering farther afield. So far, few properties have been developed to any extent, in most cases only sufficient work having been done to keep the claims alive.

I only assumed office in June last, and have been so occupied by the office work occasioned by the activity in land matters that I am not yet in a position to deal with the mining situation in as exhaustive a manner as I should like to, and this, my first report, will be confined to a digest of the records of this office of the locations and work recorded during the season just closed.

Hazelton District.

During the past year considerable activity has taken place on Nine-mile mountain, a new camp situated nine miles distant from the town of Hazelton. Much prominence has been

given to this camp from the finding of high-grade silver-lead ores, samples from many of the locations assaying over $100 to the ton. Capital has been attracted from outside sources, and a number of the properties have been bonded at remunerative figures.

The following condensed list is given as an indication of the locations and work which have gone on record :—

Boundary—Five open cuts. *Baber*—Two open cuts. *Buckskin No. 1*—Open cut. *Buckskin No. 2*—Open cut and shaft 7 feet deep. *Buckskin No. 3*—Open cut. *Duke*—Open cut. *Duchess*—Open cut and stripping. *Dawson Fraction*—Two open cuts. *Erie*—Shaft 7½ feet deep and strippings. *Golden Crown*—Rock cuts and stripping. *Hazelton* group—Three open cuts and trench 30 feet long. *Isabella*—Open cut and two shafts 6 feet deep. *Kootenay*—Three open cuts. *Morning Star*—20 feet stripping. *Mary Jane*—Shaft 7 feet deep and drift. *Martha Fleming*—Trail and tunnel work. *Noonday*—Open cut. *Reno*—Open cut. *Silver Bell*—30 feet of open cuts. *Silver Dollar*—Two open cuts. *Silver Cup*—Two open cuts. *Silver Pick*—Open cut, stripping, and crosscut lead. *Sunrise* group—Five open cuts and stripping. *Victoria*—Side cut 20 feet long. *White Star*—Two open cuts. *Wild Rose*—Open cut. *Yonkon*—Six open cuts.

Meanskinisht.

Anna—10-foot tunnel (rock). *Clara Bell*—8-foot tunnel and open cuts. *Emma*—10-foot tunnel. *Hazelton*—10-foot tunnel. *Nelson No. 1* and *Nelson No. 2*—Three open cuts and two tunnels. *Portland*—Open cut. *Princess May*—12-foot tunnel.

Kitselas.

Avon—10 feet tunnelling, *Golden Crown*—6 feet tunnelling. *Granite*—6-foot tunnel. *Lucky Jim*—6-foot tunnel. *Lucky Jim*—20-foot tunnel. *Maple Leaf*—18-foot tunnel. *Noble*—6-foot tunnel. *Ruby*—6-foot tunnel. *Shamrock*—18-foot tunnel. *Toulon* group—Tunnel work to value of $1,950.

Lorne Creek.

Cinnamon—Crosscutting ledge 20 feet long and open cuts. *Hillside* group—Four open cuts. *Mother Lode*—Three open cuts, hard rock. *Nickel*—Open cut, removing capping, and start of shaft.

Hudson's Bay Mountain District.

Anaurus and *Little Heather* group—12 feet surface work. *Baltic*—Open cut. *Dandy Fraction*—Nine open cuts. *Dominion Day* and *Newcastle* group—Two open cuts. *Empire* group—Seven open cuts and stripping. *Extension* group—Ten open cuts and stripping. *Iron King*—Surface crosscut 18 feet wide, 10 feet deep. *Lucky Boy*—Open cuts. *Last Chance*—Two open cuts. *Myrtle Fraction*—Open cut, rock work. *Mocking Bird*—125 feet stripping. *Pacific* group—Open cuts and shaft 8 feet deep. *Silver Creek* group—Two open cuts. *Silver* group—25-foot tunnel in rock. *Sheedy* group—Open cuts, 45-foot tunnel, and shaft 15 feet. *White Swan* group—Open cut.

Telkwa District.

Amy Fraction—Open cut. *Anniversary*—Open cut. *Anna*—Two open cuts. *Butte*—Open cut. *Black Jack*—Open cut. *Big Chief*—Open cut. *Bell Mare*—Eight rock-cuts and surface-stripping. *Boston*—Open cut. *Copper Queen*—Open cut. *Copper Basin*—Two rock-cuts and surface-stripping. *Copper Ridge* and *Copper Peak* group—Six open cuts (rock work) and stripping. *Cariboo* and *Shamrock*—Two open cuts and surface-stripping. *Copper Bluff* and *Copper Dome* group—Four rock-cuts and surface-strippings. *Coronado, Coronado Frac-*

tion and *Home Run* group—Two open cuts and 30-foot tunnel, partly timbered. *Colorado*—Tunnelling. *Dominion*—Open cut (rock). *Empire*—6 feet of trench. *Eva*—Two open cuts. *Eau Galla*—Open cut. *Eagle*—Two open cuts. *Evening*—Open cut. *Copper King*—Open cut. *Fourth of July*—Open cut. *Forrest* group—Five open cuts. *Granville*—Open cut. *Gem*—Open cut. *Hunter*—Two open cuts. *Hudson*—Open cut. *Howson*—Two open cuts. *Home Run*—Open cut. *Homestead*—Two open cuts. *Hillcrest*—Two open cuts. *Helen*—Open cut. *Heather Bell*—Two open cuts. *Idaho*—20-foot tunnel. *Iron Mask*—Open cut. *Iron Colt*—Open cut. *Independence*—Open cut. *Ivanhoe*—Survey work. *Iron Mask*—Open cut. *Ibex*—Open cut. *King*—15-foot tunnel (rock work), timbered; old workings repaired. *Keystone* and *Eldorado*—10-foot tunnel and open cut. *Kyle*—Two open cuts. *Kamloops*—Two open cuts. *Lake View*—Six feet of trench. *Lukens*—Open cut. *Lucky Strike*—Two open cuts (rock). *Lake View* group—Two open cuts. *Bonanza*—Open cut. *Last Chance*—Two open cuts. *Mohok*—15-foot tunnel (all rock). *Mountain Goat*—Open cut and 10 feet of trenching. *Morning*—Two open cuts. *Mineral Hill*—Open cut and 3 feet of tunnel work. *Maple Leaf*—Open cut. *Maude Fraction*—Two open cuts and 5 feet of tunnel. *Mammoth Bluff* and *Copper Bluff* group—Open cut and surface trench. *Mountain View*—Open cut. *Nell Fraction*—Four open cuts. *New Discovery No. 2*—Two open cuts. *Normandy*—Two open cuts. *Osceola*—Open cut. *Ophir*—Open cut. *Prince of Copper*—Open cut. *Pearl*—Nine feet of trench. *Princess of Copper*—Open cut. *Rainbow*—Open cut; old workings repaired. *Russell*, *Cumberland*, and *Sundown* group—Two open cuts. *Reno*—Open cut. *Revenue*—Open cut. *Rossland*—Two open cuts. *Star* group—Four open cuts and strippings. *Stanley*—Open cut. *Strathcona*—Two open cuts. *Silver Crown*—Open cut. *Silver Plate* group—Three open cuts. *St. Croix*—Open cut. *Summit* group—Three open cuts. *Scallon*—Open cut. *Tenderfoot No. 1*—Two open cuts. *Tenderfoot No. 2*—Two open cuts. *Virginia*—Two open cuts. *Virginian Queen*—Open cut. *Victoria*—Three open cuts. *War Eagle*—Open cut. *Wild Flower*—Open cut. *Walter*—Two open cuts. *Waverly*—Survey work. *Yale*—Open cut.

Babine Range.

On the *Dibble* group, acquired under bond by the Babine-Bonanza Mining Company, considerable development work has been done, a force of nine men being employed during the summer months, and during the winter months a force of six men is being steadily employed. From latest reports this property is showing up well with development.

On the *St. Eugene* group—at present under bond to C. F. Law, of Vancouver—development work was proceeded with during the past summer. The ledge was uncovered and stripped for a distance of 800 feet; two shafts were sunk, one 60 feet in depth, and the other 35 feet in depth. Solid galena ore was encountered at a depth of 10 feet and continued to the bottom of the shafts.

Babine—Open cut. *Copper King*—Open cut and 20 feet of ditch. *Copper King*—Crosscut 16 feet long. *Celtic*—Open cut. *Commander*—Open cut and driftings in tunnel. *E. & E.*—Two crosscuts. *Free Booter*—Open cut. *Jefferson* group—25-foot tunnel. *Last Chance*—Crosscut. *Little Wonder*—Open cut and ten miles of trail. *Last Chance*—Open cut and ten miles of trail. *Mountain Goat*—Two open cuts and crosscut. *Melvina*—Open cut. *Mountain Goat*—Two open cuts. *Pack Train* group—41 feet of tunnel, four open cuts, and shaft 35 feet deep. *Snow Storm*—Open cut. *St. Helene*—8 feet of shaft. *St. Eugene*—10 feet of tunnel work in rock. *Three Lake* group—Open cut, 24 feet of tunnel, and 13-foot shaft. *Victory* group—18 feet of tunnel.

OFFICE STATISTICS—OMINECA MINING DIVISION.

Mineral claims recorded	260
Placer claims recorded	197
Certificates of work	288
Transfers	69
Free miner's certificates	521
Mining receipts issued	683
Placer-mining leases	10

Revenue.

Free miner's certificates	$4,952 20
Mining receipts, general	4,076 00
Total	$9,028 20

PEACE RIVER MINING DIVISION.

REPORT BY F. C. CAMPBELL, GOLD COMMISSIONER.

I have the honour to submit herewith my report on mining conditions in the Peace River Mining Division for the six months ending 31st December, 1909.

This Division, which was only constituted on the 1st July, 1909, comprises the drainage area of the Peace river lying to the east of the summit of the Rocky Mountains, and was formerly the eastern part of the Omineca Mining Division. Owing to its isolated position, but little progress can be expected until transportation facilities are afforded, or, at least, may be expected within a definite period. However, during the summer months, a few prospectors have been working in the Division, but no record of minerals (other than coal) has been made, or any success reported. Ten licences to prospect for coal or petroleum have been applied for during the period covered by this report, which, if granted, will make forty licences of this nature held within this Division. I have no doubt but that, at some future date, large deposits of coal will be discovered and worked in this part of the Province.

Flour gold has been found on the many bars of the Peace river, but not in sufficient quantities to offer any inducement to the individual miner; however, I believe these bars are well worth investigation as dredging propositions.

SOUTH-EAST KOOTENAY DISTRICT.

FORT STEELE MINING DIVISION.*

Report by J. F. Armstrong, Gold Commissioner.

I have the honour to submit a report on the progress of mining in the Fort Steele Mining Division for the year 1909.

The following table shows approximately the number of mineral claims held during each year since 1899:—

Year.	Held under Crown Grant or Certificate of Improvement.	Certificate of Work.	New Locations.
1899	37	718	729
1900	71	704	470
1901	104	642	455
1902	117	451	253
1903	142	335	200
1904	167	260	169
1905	189	193	181
1906	241	235	160
1907	254	160	115
1908	264	150	100
1909	280	154	116

Mineral Claims.

There has been a slight increase in mining activity in this district, as may be seen by the above table. This activity has been chiefly in the neighbourhood of Moyie, where development work has steadily progressed on the *Aurora* and *Society Girl* groups, and where several new locations have been recorded. On the *Society Girl* group, at Moyie, a tunnel extending some 1,040 feet has been run, I hear, with most encouraging results.

Very little work has been performed in placer-mining, owing to the great scarcity of water.

Office Statistics—Fort Steele Mining Division.

Mineral claims recorded	116
Placer claims recorded or re-recorded	6
Certificates of work	154
Certificates of improvements issued	16
Conveyances and other documents of title	27
Partnership agreements	1
Gold Commissioner's permits	7
Documents filed	13
Affidavits filed	214
Records of water grants and permits	3
Mining leases issued	14
Mining leases in force	49
Free miner's certificates (ordinary)	357
" " (company)	4
" " (special)	2
Crown grants issued	20

* *See* also, on following page, notes of Provincial Mineralogist on the metalliferous mines of this district, and his report on the coal-mines of the district, under heading of "Coal-mining."

Revenue.

Free miner's certificates	$1,695 00
Mining receipts	3,025 80
Total	$4,720 80

FORT STEELE MINING DIVISION.

NOTES BY W. F. ROBERTSON, PROVINCIAL MINERALOGIST.

Prospecting for metalliferous deposits in the Fort Steele Mining Division has been gradually diminishing, and during the year 1909 only 116 new claims were recorded, as against 729 in 1899; a similar falling off is noted in the number of certificates of work recorded. Actual mining, or serious attempts at mining, were found to be confined to the vicinities of Moyie lake and Kimberley, and the following mines were visited by the Provincial Mineralogist during the summer of 1909:—

St. Eugene Mine.

The *St. Eugene* mine, owned and operated by the Consolidated Mining and Smelting Company of Canada, is the largest producer of lead in British Columbia, producing in 1908 about 65% of the total output of the Province for the year, and in that year mined approximately 160,000 tons of ore, yielding about 8.8% lead and 3.6 oz. of silver to the ton. In 1909 the lead produced was 59.5% of the total output of the Province. The ore mined, some 147,300 tons, also gave about 8.8% lead and 3.6 oz. of silver to the ton. The ore is galena in a quartz gangue with a little zinc blende, and is essentially a concentrating proposition, all the ore going to the concentrating-mill. The ore-body occupies a fissured zone in a quartzite (altered slate) formation, the ore occurring in somewhat irregular lenses. On either wall of the main fissure are what might be called separate veins, each about 6 feet wide, the north and south veins, connecting which are cross-fissures—or, as they are here called, "avenues"—probably caused by the crushing into somewhat large regular blocks of the quartzite when the zone was formed. These "avenues" are more or less parallel and are at an acute angle with the main fissure, and in these the largest ore-bodies are found at or near their juncture with the main veins; these ore-bodies are often very large, having sometimes a width of 60 feet or more. Without exception, the "avenues" terminate at the main parallel veins, outside the limits of which no important chutes of ore have as yet been encountered. The main vein outcrops near the hilltop on the east side of Moyie lake, about 2,000 feet higher than the lake and 5,000 feet to the eastward; the vein has been developed for all that distance, practically, to the lake shore, which is the western limit to the company's property. The upper part of the mine, from the highest outcrop driven to the 1,800-foot level, about 75 feet vertically higher than the lake, has been worked by adit tunnels, driven in on the vein. Below this level the mining is done from a vertical three-compartment shaft (each compartment 3 feet by 5 feet in the clear), which has been sunk to a depth of about 800 feet, or about 700 feet lower than the lake level. From this shaft five levels have been driven—1,900, 2,000, 2,100, 2,200 and 2,400; between the 1,800 and 1,900-foot levels the distance is 125 feet, while between the others the distance is 150 feet. The ore from the workings at the 400-foot level and above is delivered to the mill by an aerial tramway (Riblet) some 5,000 feet long; that from between the 400 and 1,800 goes down mine chutes to the 1,800, out of which it is trammed, coming out at the shaft, from which point it, together with the ore from the shaft, is hauled by electric motor to the concentrating-mill. The 1,300 level is in on the main vein about 5,200 feet, and

LEAD-SMELTING PLANT AT MARYSVILLE, EAST KOOTENAY, FORT STEELE MINING DIVISION.

the 1,800 level about 4,400 feet from the portal; from the shaft the workings are chiefly to the east, the 2,200 level being driven about 1,000 feet and the 2,400 level about 400 feet. In the summer of 1909 about half the ore being produced was from the 2,100 level.

Philip Argall, in the report of the Zinc Commission, says that "the longitudinal section of the veins shows that the stoping conforms fairly well to the contour of the hill, and that a line drawn parallel with the latter at a depth of 200 feet would possibly include all the richer stopes in the veins." Mr. Argall wrote this in 1905, and it may apply to the higher workings on the vein, but more recent developments in the shaft workings would indicate that the profitable impregnation of the veins in these workings was much greater.

The following description of the *St. Eugene* mill is from a paper by Mr. E. Jacobs in the "Engineering and Mining Journal":—

The Concentrating-mill.

The *St. Eugene* concentrating-mill is substantial in construction and its equipment is modern in character. It is situated near the lake and close to the Crow's Nest branch of the Canadian Pacific Railway Company, thus providing convenient and advantageous transportation facilities. The accompanying plan of the mill is numbered and lettered to show the flow of the ore in treatment.

The ore, conveyed from the mine by aerial and electric tramways, upon delivery at the mill is weighed and dumped into receiving bins, of which there are four—one each for coarse and fine ore from the lower levels and the other two provided with a grizzly for separation of the coarse and fine of the mixed ore from the upper levels. Automatic feeders discharge the fine ore on a belt which conveys it to a 30-mm. trommel. The fines from this trommel are taken by a conveying belt to an elevator leading to the concentrator storage bin. A 36-inch picking belt takes the oversize from the trommel, also the ore from the coarse-ore bins after the latter has passed through a 24 x 15-inch Farrell crusher.

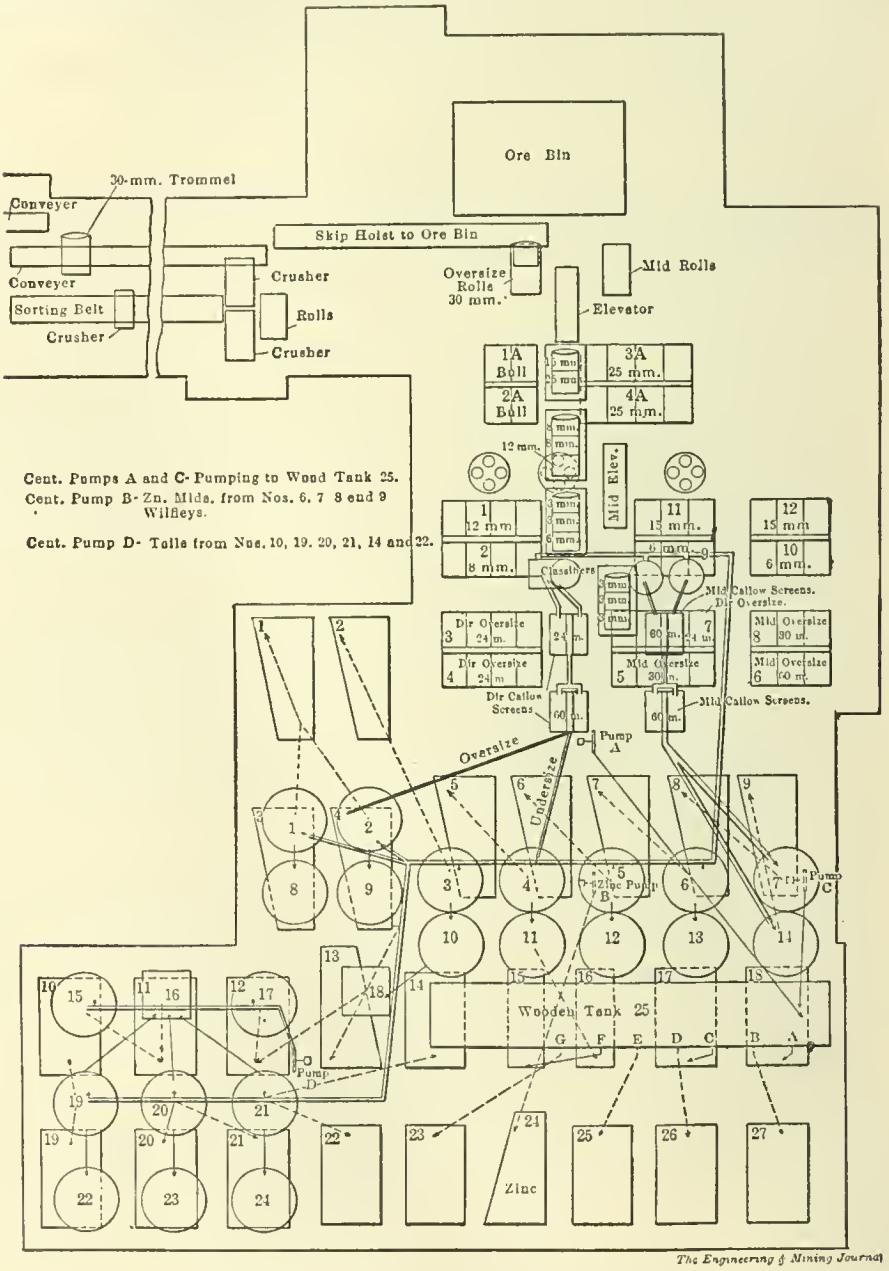
On an average there are four men working at this belt, two picking out waste and two picking out the higher grade crude ore, more or fewer being employed as occasion requires. The discharge from this belt is into two 9 x 15-inch Blake crushers, and thence into a set of 12 x 36-inch rolls. The ore is then hoisted by a pair of automatic loading and dumping skips to the concentrator bin, the discharge from the skips first passing through a sampler which cuts out $\frac{1}{20}$ of the entire feed. The portion thus cut out passes through another set of rolls, adjusted to $\frac{1}{4}$ inch, and then through a Vezin automatic sampler, which takes out $\frac{1}{20}$, the ore rejected being passed to the mill bin. This sampling gives a sample of $1\frac{1}{4}$ tons from the day's run of 500 tons of ore.

From the mill bin, which has a capacity of 475 tons, the ore is automatically fed to a 30-mm. trommel, oversize to rolls, undersize to an elevator discharging into a main trommel line, consisting of screens of 15, 25, 8, 12, 6, and 3 mm. respectively. The oversize of the 25-mm. screen goes to two 2-compartment bull jigs, 1*a* and 2*a*; that of the two 15-mm. screens to two 4-compartment jigs—3*a* and 4*a*. The feed of jigs 1*a* and 2*a* is thus over 25 mm., and that of 3*a* and 4*a* is 25 to 15 mm. The middlings from 1*a*, 2*a*, 3*a*, and 4*a* pass through a set of 24 x 30-inch rolls, set up to about $\frac{1}{4}$ inch, thence back to main elevator and trommel line.

The oversize of the 12-mm. trommel is fed to jigs Nos. 11 and 12, each 3 compartments; the oversize of the 8-mm. trommel to jig No. 1, 4 compartments; the oversize of the 6-mm. trommel to jig No. 2; the oversize of the 3-mm. trommel to jigs Nos. 9 and 10, 3 compartments. The undersize from the 3-mm. trommel goes to two classifiers, the hutches of which feed two 24-mesh Callow screens and the undersize feeds two 60-mesh Callow screens. Oversize of the 24-mesh Callow screens goes to jigs Nos. 3, 4, and 7; over- and undersize of 60-mesh Callow screens to tables Nos. 4 and 5 respectively.

FINE CONCENTRATION.

Table No. 4, which is fed with the oversize, makes 75 per cent. lead concentrates; the tailings and slime water go to table No. 13 for retreatment. Table No. 5 treats undersize which is fed from Callow tank No. 4. The concentrates from this table contain about 82 per cent. lead. All the slime water from this table goes to the concentrate bin, the original feed being about 50 per cent. lead. Callow tank No. 4 sloughs off into No. 11, which feeds vanner No. 16; the water sloughed off tank No. 11 goes to tail-race.



SKETCH OF ST. EUGENE MILL SHOWING FLOW.

The middlings from all the jigs under 25 mm. go to three Huntington mills. These mills have from 16- to 30-mesh screens; the crushed product goes to the fine elevator, thence to 3-mm. trommel; oversize back to Huntingtons. Undersize goes to two small Callow tanks, hutches discharging to two 30-mesh Callow screens, undersize to 60-mesh Callow screens; the oversize from the 30-mesh Callow screens goes to jigs Nos. 5 and 8, over 60-mesh to jig No. 6; tailings of this jig back to Huntingtons and 3-mm. trommel line. Under 60-mesh goes to Callow tank No. 7 which sloughs to No. 14. These tanks feed tables Nos. 8 and 9, or tank No. 14 sometimes feeds No. 18 vanner.

Slime water from the main trommel line is carried in a launder to Callow tanks Nos. 6, 5, 3, 2, 1, 21, 20, and 19; at each of the above numbered Callow tanks there is a small 12 x 12-inch sump, outlet at the side. This is faced with a disc of $\frac{1}{4}$-inch plate, which has different-sized holes and a blank space. The feed can be regulated or entirely shut off by the moving of the disc. Tanks Nos. 6, 5, 3, 2, 1, 21, 20, and 19 slough off into tanks Nos. 13, 12, 10, 9, 8, 24, 23, and 22. These in turn slough to the tail-race. Tank No. 10 sloughs to wooden tank No. 18, and No. 18 to tail-race. Tables Nos. 1, 2, 6, and 7 are fed from tanks Nos. 1, 2, 3, 5, and 6; vanners Nos. 15, 17, and 18 from tanks Nos. 10, 12, and 13; vanners Nos. 10, 19, 20, 21, 14, and 22 from tanks Nos. 21, 20, 19, 22, 23, and 24; vanners Nos. 16 and 12 from tanks Nos. 11, 12, and 18.

The slime water from the head end of the Wilfley tables on direct feed contains about 10 per cent. lead and is pumped by centrifugal pumps A and C to settling tank No. 25, which is 55 x 8 x 8 feet, V-shape. The overflow from this tank goes to tail-race. This tank feeds vanners Nos. 23, 25, 26, and 27. The tailings from all vanners on direct feed are pumped by centrifugal pump D to tanks Nos. 17, 15, and 16. The overflow of these tanks goes into tail-race. These tanks feed vanners Nos. 11 and 12.

The middlings from tables Nos. 6, 7, 8, and 9 carry about 18 per cent. zinc and 8 per cent. lead. These are pumped by pump B to table No. 24 and brought up to about 20 per cent. zinc and 4 per cent. lead. This product is stored for further treatment for its zinc content. The overflow from all the fine concentrate bins is carried to three settling tanks each 100 feet long. There are in the mill 16 jigs, 11 Wilfley tables, and 16 Frue vanners.

Water and Steam-power Used.

The *St. Eugene* ore is of a siliceous nature and therefore is most suitable for concentration. The quantity of ore treated daily in the mill varies from 400 to 600 tons and the concentrates made average about 66 per cent. lead.

The yearly and aggregate production of mine and mill, respectively, for five years are exhibited in the accompanying table.

St. Eugene Production.

Year.	Shipped crude, Tons.	Milled, Tons.	Concentrates, Tons.
1904 (eight months)	708	60,658	15,051
1905 (ten months)	1,126	129,582	28,235
1906	3,491	152,978	25,949
1907	401	133,988	22,667
1908	2,614	160,229	22,076

Water for milling purposes is pumped from Moyie lake by a centrifugal pump, 16-inch suction, 14-inch discharge, and of 3,000-gallon capacity. A 500-gallon Underwriter pump supplies water to a sufficient number of hydrants to afford protection against fire. Both water and steam-power are available for the operation of the mill, while the latter is also used

for mine-power purposes. Water for power is obtained from four creeks, and flows through two flumes of nine and four miles length, affording heads of 475 and 600 feet respectively. The mill crushers and jigs are driven by two Pelton wheels, 52 and 48-inch, and the vanners and tables by a 36-inch Pelton.

The main steam plant consists of two Babcock & Wilcox water-tube boilers, each of about 250 horse-power, and four horizontal return tubular boilers—three of 150 and one of 60 horse-power. There are, as previously stated, also three 100 horse-power boilers at the *Lake Shore* shaft. Superheated steam is used throughout. When it is necessary to use steam, the mill machinery is driven by a 250 horse-power Corliss engine. A 250 horse-power compound condensing engine is being added. The generator for the electric tramways and the 3,000-gallon supply-pump for the mill and other equipment will be driven by this engine.

Two air-compressors supply air for the operation of 45 machine drills in the mine, and for other uses. One of these is a two-stage Rand, compound condensing engine with a capacity of 3,000 cubic feet of free air per minute; the other is a single-stage compound condensing compressor having a capacity of 1,600 cubic feet of free air per minute. Air is used at 105 lb. pressure. Air-pipe lines to and in the mine total about 20 miles in length.

W. H. Aldridge, of Trail, is managing director of the Consolidated Mining and Smelting Company, of Canada, Ltd., controlling this group of mines; R. H. Stewart, of Rossland, is manager of the company's mines; and Selwyn G. Blaylock, of Moyie, is superintendent of the *St. Eugene* mine and mill.

Society Girl.

The *Society Girl* group consists of seven Crown-granted mineral claims situated a couple of miles to the south-east of the town of Moyie, just over the summit of the first range of hills that lies to the east of Moyie lake, and at an altitude of from approximately 5,000 to 5,200 feet at the upper workings, or 2,000 feet above the lake. The property is owned and operated by the Society Girl Mining Co., a company composed of working miners and prospectors, of which Charles Farrell is the moving spirit. The company, in August, 1909, was employing eleven men, who were being paid chiefly in stock of the company, so that the enterprise has assumed practically the form of a miners' co-operative partnership. The property is reached by waggon-road from Moyie by following up the *St. Eugene* mine road to the upper workings of that mine, whence a branch road has been built to the south along the western slope of the hill for about a mile, when it deflects to the east through a gap in the hill for another mile. The company is without funds to attempt any expensive development, but has done a great deal of such work as can be accomplished by prospectors by their own exertions. The workings are largely superficial, consisting chiefly of open cuts and prospect shafts of no great depth, in many of which promising ore was found. A tunnel has been run in for 250 feet, above which an amount of stoping has been done to a height of 80 feet, when the surface was reached; from these workings, it is reported by the foreman, about 700 tons of ore have been extracted. Some 400 feet lower than this upper tunnel a lower tunnel has been started, and was then in 721 feet, but had not at that time struck ore, nor was ore expected until the tunnel had been driven 850 feet, at which distance it was hoped that the ore-body from the upper tunnel would be encountered; it was expected that this work would be completed by the fall. The country along the summit of this range of hills is much broken, thus affecting the vein on this property, which is somewhat irregular in the upper workings; it is hoped, as the workings get lower down the hill, that the strata will be found more undisturbed, as was the case in the *St. Eugene*. The ore is essentially galena, carrying about $\frac{1}{2}$ ounce of silver to the per cent. of lead, occurring in a quartz gangue, associated with which is some zinc. In these surface workings the galena has been much oxidised and affected by surface influences, so that the ore

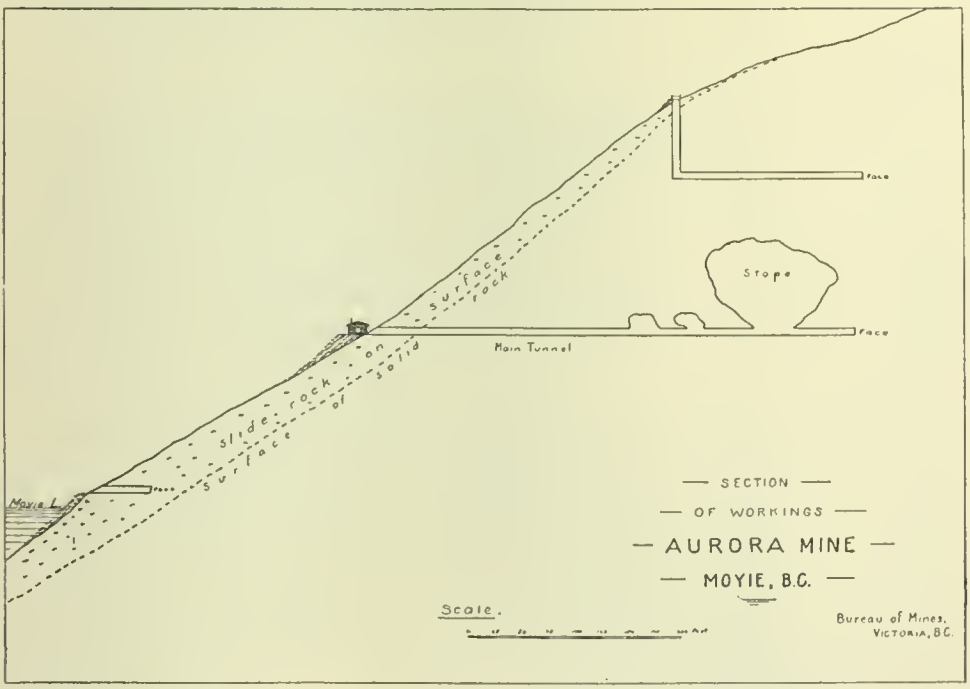
CAMBRIAN MINING CO.'S CAISSON, MOYIE, EAST KOOTENAY.

SOCIETY GIRL MINE, MOYIE, EAST KOOTENAY.

as mined is chiefly lead carbonates with some galena. In the workings a variety of secondary minerals were noted, some very pretty crystals of pyromorphite being seen which occasionally carried as high as 70 ounces in silver. The property is at present a promising prospect, and the result of the work in the lower tunnel will largely determine whether it becomes a mine.

Aurora.

The *Aurora* mine is located on the west side of Moyie lake, opposite the town of Moyie and the *St. Eugene* mine, and, approximately, in the line of the strike of the *St. Eugene* vein, of which it is popularly considered to be an "extension," although this has not been demonstrated as a fact. The *Aurora* mine, starting from the western shore of the lake, cuts up the hill with a strike similar to the *St. Eugene*. At an elevation of some 200 feet above the lake a tunnel has been driven in along the strike of the vein for a distance of 450 feet. Near the face of this tunnel a stope has been raised above the level, having a maximum height above the level of some 85 feet and a maximum length of 125 feet; between this large stope and the mouth of the tunnel the tunnel had been run through two smaller bodies of ore, the dimensions of which have not been ascertained. The face of the tunnel is approximately 275 feet vertically below the surface. About 160 feet vertically above the main tunnel level, and almost above the big stope on that level, a shaft has been sunk to a depth of 75 feet, from which a drift has been run to the west for 180 feet, in which some ore was encountered, leading to the expectation that the ore in the main stope may continue up to that level. Some 150 feet vertically below the main tunnel and a few feet above the lake level, sufficient only for a dump, another tunnel has been started, but at that time—August, 1909—was still in slide-rock.



The ore is galena, with some lead carbonates, carrying silver very similar in character to the *St. Eugene* ore, the ratio of lead units to ounces of silver being about as 1 is to 2, and carries a little zinc blende; the gangue is quartz. The better grade of ore will run about 20 % lead and 10 ounces of silver, but the mass of the ore will require concentration. The vein is

not very regular and varies in width from 1 foot to 4 feet, averaging about 2 feet in width. The vein, though continuous, is not uniformly mineralised, but the good ore occurs in lenses. The property is owned by Messrs. Rader, Johnson & Sanborn, and is being worked under bond by the Aurora M. & M. Company, of which J. A. Harvey is president and J. W. Fitch is vice-president. This company has installed on the beach, as a temporary plant, a boiler and air-compressor, and contemplates, if the development continues satisfactory, the installation of a concentrator. The company was employing sixteen men, under the superintendence of H. H. Dimmock.

Cambrian Mining Co.

The Cambrian Mining Company, of which the chief officers are J. C. Hyde, of Reading, Kansas; A. B. Cooper, of Nelson, B. C., with Charles A. Mackay, of Moyie, as secretary, is of interest chiefly in that it is attempting to accomplish something that has never been done in British Columbia—viz., to open and operate a mine lying under water by means of a caisson sunk through the water. The situation is about as follows: The *St. Eugene* group of the Consolidated M. & S. Co. of Canada comprises a series of claims, extending from the summit of the hill on the east side of Moyie lake down to within a very short distance of the edge of the lake, and through this series of claims there runs, in a general east and west direction, a quartz vein, carrying galena, which has been for years mined by the St. Eugene Company, producing a great deal of ore. There is little doubt but that the *St. Eugene* vein extends westward out of its property and probably under the lake; in fact, it has been argued that the same vein is found on the western side of the lake on the property of the Aurora Company, where it has been opened up. Whether it is the same vein, or another similar, has, of course, never been definitely proved. However, the lower workings of the *St. Eugene* are within a short distance of the lake, and the vein continues to the westward of these and, presumably, under the water.

The Cambrian Company has secured and has Crown-granted the *Cambrian* mineral claim, with an area of 51 acres, extending from the western boundary of the *St. Eugene* property down to and under the water. The land area ($\frac{3}{4}$ acre) was, however, not deemed large enough on which to sink a shaft, and, consequently, the company, possessed with the conviction that the continuation of the *St. Eugene* lead was to be struck under the water, attempted to reach it by a shaft put down through the water by sinking a caisson at a distance of about 200 feet from the shore. The caisson consists of two compartments, 4 by 5 feet inside, the outside and partition timbers being 10 by 12 inches dressed timbers, made in sections of 8 feet in depth, bolted together by six bolts. The frame timbers were thoroughly caulked inside and on the outside were plastered with $\frac{1}{2}$ inch of blue clay, over which was laid $1\frac{1}{2}$-inch clear boards, running vertically and spiked on with 5-inch spikes; on the outside of this there was a layer of the heaviest Paroid roofing, again covered with 1-inch boards laid on vertically. The lowest section of the caisson is provided with a steel shoe; the sections are bolted together and have been sunk, it was reported by the secretary, through 60 feet of water and 35 feet of clay, while, it was estimated, there were still 15 feet of clay to be gone through before any solid formation could be reached. The caissons have been sunk by rock piled on top of a trussed crib-work, the amount of rock employed being estimated at 350 tons. The plant, consisting of a 100 horse-power boiler and a 4-drill air-compressor in a temporary wooden building, and a carpenter and a blacksmith shop, is located on the shore, while a crude pier has been built from the shore out to and around the caisson.

On the western side of the lake, in what is supposed by the company to be the line of the strike of the vein, the *Mabell* mineral claim is located on a sandy spit, at which point it is planned to sink a second shaft at a distance of approximately half a mile from the caisson. No definite results have so far been obtained, and the work was not advanced during 1909.

Sullivan Mine.

The *Sullivan* mine is situated on Mark creek, a couple of miles above Kimberley, a station on the branch of the Canadian Pacific Railway, and was fully described in previous reports. The mine has been extensively developed and has produced a great deal of ore, while there is yet in the stopes, already opened up, a very large tonnage of ore, the stopes being from 30 to 40 feet high in solid ore. The ore is, however, low grade and difficult to treat, being a mixture of lead, zinc, and iron sulphides, with a little gangue matter, which cannot therefore be concentrated by water and must be smelted direct. The ore averages, on large shipments, about 16.5 % lead and 7 oz. silver to the ton, with a large, though varying, percentage of zinc, averaging about 14 %, iron 20 %, and silica 10 %. In 1907 the mine shipped nearly 30,000 tons of ore, but mined very little in 1908 and nothing in 1909. The Sullivan M. & S. Co. built a smelter at Marysville, a few miles from the mine, at which the ores from the mine were smelted; owing, however, to the difficulties in the treatment of the ore and the low price of lead and silver, the operation does not appear to have been profitable.

The company has now been taken over by the bondholders and reorganised under the name of the Fort Steele Mining & Smelting Co., and the mine was, in August, 1909, being pumped out by the former superintendent, Mr. Jas. Finlay, with the assistance of three men. It is understood that, when pumped out, a re-examination and sampling of the mine will be made, when the future operations of the company will be decided upon. The mine is quite sufficiently well equipped, with boiler plant, compressors, and hoisting plant, and has an aerial tramway, a mile long, from the mine to a spur on the branch of the Canadian Pacific Railway.

Marysville Smelter.

The Marysville Smelting Works was erected by the Sullivan Mining Company about the year 1904 and has been under several different managements, each with diverse ideas as how best to solve the very difficult metallurgic and commercial problem of treating the ores from the mine, practically alone, without the admixture of other ores, which serve to "help out" in an ordinary customs smelter. The plant was closed down in 1908 and has remained closed, in charge of a watchman, although it is now reported another attempt is to be made at operating both the mine and smelter, and, if advantage is taken of the past experiences and improved method recently developed in the treatment of lead ores, it is quite possible that success may follow. The plant is situated at Marysville, on a level bench, overlooking and about 150 feet higher than the St. Mary's river, at the mouth of Mark creek, and consists of :—

Sampling House.—The sampling house is a tall, four-storied wooden structure, alongside which are bins to receive the ore, dumped from cars on an elevated wooden trestle, and discharge, through proper gates, on to a travelling belt-conveyor which carries the ore to a Farrell crusher. From the crusher the ore drops into the boot of an elevator and is raised to the top of the building and drops, through a set of rolls, to another inclined conveyor, by which it is conveyed to a second elevator, again raised to the top of the building, and again falling, passes through a pair of revolving screens, the fines passing to a third elevator, by which they are again raised and deposited in elevated bins, from which the ore is run out in smaller cars to the place desired. A certain percentage of these car-loads of ore is dumped into sampling-room bins and thence on to a sampling floor, where the sample is taken out by hand quartering. The "reject" from the sampling house, not taken directly to the calciners, is placed in stock-bins, of which there are ten, on the ground level, each 27 feet by 30 feet and 12 feet deep, covered by a suitable shed. In these bins the ore is "bedded" with suitable fluxes, etc. From the stock-bins the ore is loaded by hand into buggies and dumped into a hopper on

the ground level, which discharges to a bucket belt-conveyor and is raised to an elevated bin or hopper, with a valve to regulate the flow, from which it drops on to an inclined belt-conveyor and is elevated to the top of the roasters.

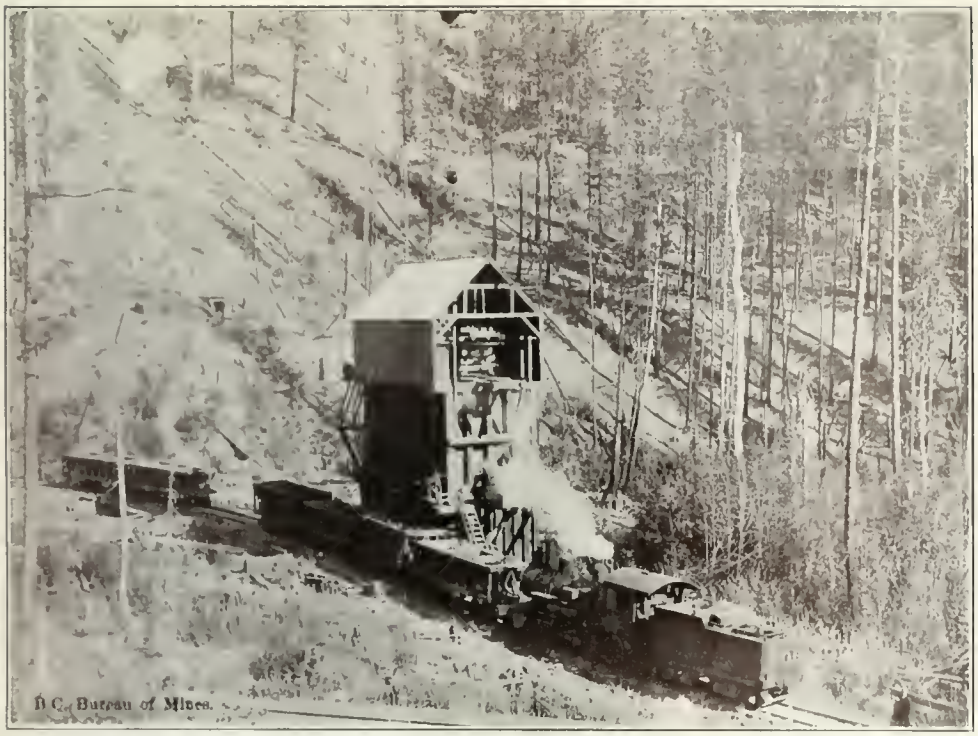
Calcining or Roasting Shed.—The calcining shed contains two hand-worked, hearth calciners and three revolving Haberlein mechanical furnaces, with space provided for three more furnaces. The plant is connected to a stack 150 feet high and 8 feet diameter, on a concrete base. There are also in an outshed ten 10-foot diameter Haberlein converters, the cinder from which is dumped on to the ground, broken up and loaded into buggies on that level and again dumped into buggies on a sunken track, which leads to an endless chain inclined elevator, which conveys the cars to the charging platform of the smelting-furnace shed. In the smelting-furnace shed there are two water-jacketed blast furnaces, each 40 inches by 144 inches inside, having eight tuyeres on a side, with cotton tuyere-pipes. There is also an ample supply of forehearths, slag-pots, etc. The air-blast plant and most of the power required about the plant is provided from turbines, located on the level of the St. Mary's river, the power being transmitted to the upper bench by wire-rope belts. There is also an auxiliary steam plant by which the works can be run during low water.

The plant shows evidence in its design of frequent changes of management and ideas, and would be expensive to operate as now laid out; it is fast deteriorating from inactivity, as smelting plants invariably do.

North Star.

The *North Star* mine is one of the most interesting in the Province, and has certainly had a chequered career. It is situated on the west side of Mark creek, a mile or so from the present townsite of Kimberley, and is reached by a branch line from the Canadian Pacific Railway at Cranbrook. The mine was opened up about the year 1895, before there was any railway in East Kootenay (the railway came in 1898-99), when the district was reached from Jennings, a station on the line of the Great Northern Railway, by a steamer plying on the Kootenay river, which is navigable when the water is "just right," neither too high nor too low. A waggon-road was built from the mine to North Star landing, on the Kootenay river a few miles above Fort Steele, and over this road a great many tons of ore were hauled out and shipped by steamer to the United States smelters before the railway was built. In those early days the ore-body developed was one of the largest and most compact bodies of solid galena ever found in the Province, and lay in a basin, almost on the surface, covered only by superficial clays, gravel, etc. The solid body of galena was in course of time mined out, and repeated attempts by various managements failed to locate any important extension of this body or to find any new body.

At this stage the mine was, practically, abandoned and left in charge of the then accountant, Mr. Neil Curran, to "clean up" all remaining fragments of the old ore-body. This cleaning-up has gone on for about four or five years; in 1907, about 2,700 tons of ore was shipped; 1908, about 3,900 tons, and about the same in 1909, carrying about 22 % of lead and 15 oz. silver to the ton. The ore now mined is chiefly "carbonates," and is in demand by the smelters, who give a smelting rate of about $4 a ton on it. The "cleaning up" process developed the fact that not only had there been left on the edges of the old stopes considerable quantities of ore, but that, overlying the old ore-body and extending for an, as yet, unknown distance up the hill, there was a body of carbonate ore of considerable thickness. The present work being done is the stripping of the surface gravels and soil, which are dropped into the old workings, and the recovery of this carbonate ore. There were about eighteen men in all employed about the property, and, as far as could be seen, the mine was no nearer exhaustion than it was three years ago.



LOWER TERMINAL TRAM, SULLIVAN MINING CO., KIMBERLEY, EAST KOOTENAY.

NORTH STAR MINE, KIMBERLEY, FORT STEELE MINING DIVISION, EAST KOOTENAY.

NORTH-EAST KOOTENAY DISTRICT.

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GOLDEN MINING DIVISION.

Report of F. H. Bacon, Acting Gold Commissioner.

I have the honour to submit my annual report for the District of North-East Kootenay for the year 1909.

Giant Mine.

Work on the *Giant* mine during the past year has been confined to making exhaustive tests of the S. S. S. dry concentrating tables. With close classification, excellent results have been obtained, concentrates of 80% lead being made with small loss in tailings. Silver values are also saved more satisfactorily than with wet tables. The ore milled averaged 12½% lead with a barium gangue. The company is so well satisfied with the tests that it has arranged for extensive development, with the idea of eventually putting in a plant capable of handling the tonnage which the present showing would justify them in reckoning on.

Monarch Mine.

There has been over 300 feet of tunnelling and about 100 feet of raising completed on this mine up to the end of the year. A three-drill compressor, driven by a 20-horse gasoline engine, was installed, together with hoisting engine, also a number of machine drills and equipment. A gravity tramway was constructed from the railway track to the new tunnel portal, 500 feet in length, about a mile of pipe-lines laid, and sundry other work done. The company intends to drift on into the mountain, raise, sink, and explore the ore-body with all the crew that can be worked to advantage, probably from twenty-five to forty miners.

All other work in the Division is practically assessment work.

Office Statistics—Golden Mining Division.

Free miner's certificates	116
Company "	4
Mineral claims recorded	51
Placer " "	1
Certificates of work	51
Notices to group	4
Conveyances	9
Crown-granted mineral claims	106

Revenue.

Free miner's certificates	$ 834 25
Mining receipts	1,075 25
Acreage tax	285 50
Total	$2,195 00

GOLDEN MINING DIVISION.

NOTES BY PROVINCIAL MINERALOGIST.

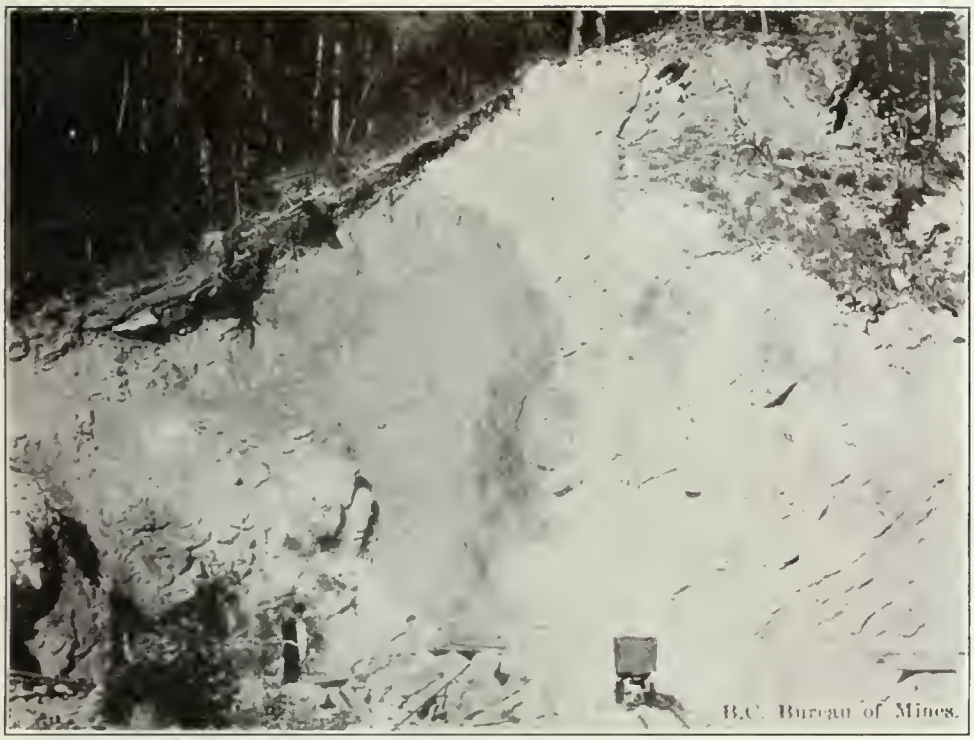
Monarch Mine.

The *Monarch* mine, at Field, has again been opened and is being prospected by the Mt. Stephen Mining Syndicate, with William Lewis as mine foreman. This property was one of the first mines in British Columbia to be opened up and worked, and is situated on Mt. Stephen, adjoining the railway track about two miles and a half east of Field station, on the Canadian Pacific Railway. At this point the railway curves around the shoulder of a precipitous bluff, and the outcrop of ore on which the mine was located was discovered, during the construction of the railway in 1885, on the face of the bluff, 700 feet vertically above tunnel No. 134, on the Canadian Pacific Railway. The outcrop seems almost inaccessible, but was reached from a slide to the eastward by building, along the face of the cliff, a gallery, supported on brackets bolted on to the rocks, to the out-crop of ore on the face of the cliff. From this outcrop a tunnel was driven in on a vein for some distance, and, according to report, a well-defined vein was followed and a considerable body of ore found. It was impossible to personally verify any of these statements, as the gallery was broken down and the old workings inaccessible.

The new syndicate has proceeded with its development by going a short distance to the east of the railway tunnel, where, beside the track, a small area of comparatively level ground was found at the side of the slide mentioned; here the syndicate has erected a wooden house and installed therein an air-compressor driven by gasoline engines, from which a 4-inch pipe-line has been run up to the workings above. From this location on the railway an inclined tramway rises at an angle of 35° to a vertical height of 300 feet, where, on the edge of the slide, but protected by timber, and under the face of the bluff, a set of bins and a gasoline hoisting plant have been erected; from this upper station a level track has been run, for about 100 feet to the west, along the slide at the foot of the bluff, at which point a tunnel, 4 feet wide in the clear, has been started, with the idea of getting under the old workings and then raising vertically to them. This tunnel, in August, 1909, was in 75 feet in a S. 30° E. direction, and it was calculated that it would have to be driven 350 feet before the point was reached at which the raise should be put up; the tunnel as far as driven, was still in slide-rock. The raise to the old workings is expected to be about 400 feet above the level of the tunnel. Samples obtained from the old workings show the ore to be galena, with about $\frac{1}{3}$ ounce of silver to the per cent. of lead, and a heavy percentage of zinc. The following analysis has been supplied by Mr. J. A. Thomson, the managing director of the syndicate, who says that the sample analysed was "taken across over 40 feet of solid ore, at two different points, several hundred feet apart, in our *Monarch* property, and no wall in sight on the right-hand side": Gold, 0.04 oz. to ton; silver, 6.0 oz. to ton; lead, 50 %; zinc, 15 to 18 %; iron, 1 to 2 %; sulphur, 12 to 14 %; silica, 1 to 2 %; lime, 4 to 6 %.

Giant.

The *Giant* group consists of the *Giant*, *Dwarf*, *Midget*, and *Giant Fract.* mineral claims, owned by the Golden Giant Mines, Limited, of Golden, B. C. The property is situated on the left bank of the Spillimacheen river, about seven miles in from Spillimacheen landing on the Columbia river, and is at an altitude of about 3,500 feet on the south-west side of Spillimacheen mountain. This claim, formerly owned by W. J. R. Cowell, assayer, of Victoria, was noticed in the Report of this Department for 1898. There appears to be a line of contact of limestone on the south with a black-coloured slate on the north, which contact has a general east and west strike, and dips to the south at an angle of from 60° to 80°. Along this line of contact the lime seems to be more or less completely altered into barytes for a width of from 20 to 30 feet, when the



GIANT MINE, GOLDEN MINING DIVISION. Open Cut.

MONARCH MINE, FIELD, GOLDEN MINING DIVISION.

barytes gives place gradually to a silicification of the limestone. This zone of barytes is in parts heavily impregnated with galena to the extent of from 5 % to 10 %, together with some zinc, arsenic, and antimony sulphides. The galena is fine-grained, and occurs in numerous small seamlets running through the barytes gangue, and carries silver values in about the proportion of one ounce to the per cent. of lead. As far as could be determined by inspection, the mineralisation diminished with the barytes, both being strongest next to the slate.

The principal excavation was an open side-hill cut about 60 feet long, in at the bottom 50 feet, and having a face of from 30 to 40 feet in height.

No. 3 tunnel has been driven in 324 feet, the first portion through barytes, and the latter portion following in the slate, parallel with the contact, while at the inner end of the tunnel a crosscut has been made for 15 feet into the barytes. The mineralisation does not appear to follow into the slate, and does not appear to be equally strong at all points in the barytes.

No. 1 tunnel is 50 feet below the open cut, and has been driven in for 264 feet in a northerly direction, crosscutting the barytes lime formation and ending with slate in the face. Ore was encountered at 60 feet in on the tunnel, on a loose slip, which was also visible on the surface.

From a couple of bins just below the open cut an inclined tramway has been built down to the concentrating-mill.

Mill. The mill consists of upper ore-bins, feeding to a 6 by 12-inch Blake crusher, from which the ore passed on to a Robins conveyor picking-belt, then over a grizzly screen, the fines passing directly to the crushed ore-bin, and the roughs through a Farrell crusher into the same bin. From the crushed ore-bin the ore was fed by an automatic feeder to a pair of rolls.

The further scheme of the mill was at the time of the visit too badly disorganised to be recognisable. It appears the mill had been used for the Elmore oil process, which, according to the manager, while it had been successful in making a good separation, was too expensive in its operation to be continued; this work, it is understood, was under the direction of Mr. Claudet, of Rossland. Later, the company engaged Mr. Lewis Hind, who installed a couple of "Texas tables," an appliance made by Sutton, Steele & Steele, of Dallas, Texas, which resembles a Wilfley table in shape, but on which no water is used, the bed of the table being covered with cotton cloth; the bed is perforated with innumerable small holes, through which air is forced under pressure, and, coming up through the cotton cloth, half "floats" the ore, enabling a separation to be made, as in a Wilfley table with water. The plant was not working—in fact, was only in the experimental stage, so it was not seen in operation; but Mr. Hind, seen later in Victoria, claimed to have made an excellent separation with this table, provided the ore was previously accurately sized.

WINDERMERE MINING DIVISION.

Report of E. J. Scovil, Mining Recorder.

I have the honour to submit herewith a brief report upon the Windermere Mining Division for the year 1909:—

I regret to state that I am unable to report for the year 1909 the amount of progress that I anticipated, for the reason that no railway construction has been done during the past year. However, this is now provided for, inasmuch as it is now generally conceded that the Canadian Pacific Railway Company will build the Kootenay Central Railway, and that at least fifty miles will soon be under actual construction. The advent of this railway will

undoubtedly give mining in this Division an impetus, and will allow the *Paradise* mine and others to commence active shipments. Nothing of any consequence in the way of development work was done during the past year; in fact, little more than the usual statutory assessment work.

OFFICE STATISTICS—WINDERMERE MINING DIVISION.

Free miner's certificates	70
" " (special)	1
Conveyances, etc.	14
Assessments	46
Locations	22
Water records	65
Revenue	$2,452 35

WINDERMERE DIVISION.

NOTES BY THE PROVINCIAL MINERALOGIST.

In the vicinity of Windermere lake, and tributary to the town of Wilmer, there is to the westward, on the watersheds of Toby and Horse Thief creeks, a considerable area of country in which prospecting has indicated a large number of outcrops of mineral, chiefly galena, usually carrying high values in silver. As a rule, these discoveries have not been sufficiently developed to fully demonstrate their value, but, with a couple of exceptions, the quantities of ore exposed have not been large. This whole district was reported upon in the Report of this Bureau for the year 1898, and this locality was later examined and reported upon by the writer in 1903. During all this time it has been expected that each year would see a railway through the Columbia river valley an accomplished fact, but the time of waiting is not yet passed, although, if the promises and statements of the railway officials are of any value, the season of 1910 should see the railway construction well under way. The transportation charges, both for supplies into and out of the district, are necessarily so expensive that the property owners have been loath to do any more work than they were forced to do until the railway was actually built, and hence the district is in about the same condition as when last reported upon.

Paradise Mine. The *Paradise* mine, on Spring creek, a small tributary flowing into Toby creek about twenty miles from the mouth, was fully described in the Report for 1903, when a large amount of ore was reported as blocked out; since then very little change has taken place in the condition of affairs, therefore the property was not again visited this year, the reader being referred to the Report of 1903. The agent of the property is still Mr. R. R. Bruce, of Wilmer, B. C.

Ptarmigan Mine. The *Ptarmigan* mine, on Horse Thief creek, also reported upon in 1903, has since then been practically dormant and has not been further developed. The former manager, Mr. Thomas Starbird, is still upon the property, although no work is being done at the mine.

The only properties in the district which shipped ore in 1908 were the *B. C. and Tilbury*, about 27 tons, and the *Hot Punch* 15 tons, and in 1909 the only shipment was from the *Hot Punch*, about 15 tons.

The following properties on Toby creek were visited during the past season:—

B. C. and Tilbury. This property is situated on the north fork of Toby creek, on the east side of the Delphine basin; the workings are at an altitude of 8,800 feet, well above timber line and near the summit of the range. The property is reached from the waggon-road which the Provincial Government has built up the valley of the

H. C. AND TILBURY MINE, TOBY CREEK, WINDERMERE M. D.

DELPHINE GLACIER, NORTH FORK OF TOBY CREEK,
WINDERMERE MINING DIVISION.

north fork, by a switchback trail a couple of miles long and very steep, but over this a pack-train can make two trips a day, and it serves very well for development purposes. The property is so situated that, should it be required, an aerial tramway could readily be run from the mine to the waggon-road. The country rock in the vicinity is schist, lying nearly horizontal, and this is cut in a S. 65° E. direction by a small but regular fissure vein of quartz, about 12 inches wide, dipping at 80° to the east. In this vein there is about 1 inch of quite rich ore on the hanging-wall side, while on the foot-wall there is about 4 inches of ore, but not so rich, and between these about 6 inches of quartz. The vein has been stoped out to a depth of about 70 feet from the surface and for a length along the vein of about 75 feet. A crosscut tunnel, 40 feet long, has been driven from the hillside into the vein, at a depth of about 40 feet from the outcrop. The ore, as shipped from the mine, ran about 50 % lead and 70 oz. silver to the ton.

Sweepstake.

About half a mile to the north of the *B. C. and Tilbury*, and at a slightly higher elevation, almost on the summit of a barren rocky range which slopes at an angle of 35° to the creek bottom, is what is locally known as the *New Strike*, or, as best could be made out from the posts, the *Sweepstake* mineral claim. The formation on the summit is exceedingly loose and irregular, but there was seen there a small quartz vein, approximately in the line of the strike of the *B. C. and Tilbury* vein, occurring in a quartz schist and varying in width from a stringer up to 6 inches, having an average estimated at from 2 to 3 inches. The vein, although small, contains some very rich ore, copper glance and galena with good silver values. About 2 tons of ore had been mined and sacked and was awaiting shipment. A branch trail from the *B. C. and Tilbury* trail had been partly constructed, and would have to be completed before any shipment could be made. No work was being done on the property during the summer of 1909, and that previously done had only shown the surface af the vein.

Delphine.

The *Delphine* is situated on the north side of the north fork of Toby creek, near the head of this fork, or some six miles up from the main creek. The mine is about half-way up to the summit from the waggon-road in the valley of the north fork. The property, as at first developed, contained one of the finest surface showings of galena ore seen in the Province and was described in a previous Report of this Bureau. Since then considerable work has been done on the property; quite a number of tons of galena ore shipped, running from 60 to 70 % lead, with from 50 to 60 oz. of silver to the ton. No work has been done on the property for some years, and the workings are now in such a dilapidated condition that nothing could be learned from an inspection; it is, however, reported that the body of clean ore, previously reported, was mined out, and evidently very little development had been done to find other ore-bodies, and then the mine was shut down and has since remained idle. The property has possibilities, greater than its present condition would argue, and it is possible, now that the Government has built a waggon-road up the valley of the fork and that a railway up the Columbia seems assured, that the property may be further developed. Mr. R. R. Bruce, of Wilmer, is the agent of the property.

M. T. Fraction.

The *M. T. Fraction*, owned by R. S. Gallop, contains an extension of the *Delphine* lead for about 100 feet in length, which has been completely stoped out, and the shaft, down some 60 feet, has been filled in with rock, so that this lead, on this property, may be considered as worked out. There is, however, about 150 feet vertically lower down the hill from the upper workings, and near the *Delphine* stables, a second parallel lead which has been exposed in an open cut, showing a little galena

Hot Punch No. 2.

The *Hot Punch No. 2*, owned by E. Stoddart and Ben Abel, is situated on the south side of the North fork on a small stream coming down from one of the glaciers that are its source. The country rock in the vicinity of the mine is schist, and there is found cutting it a fairly well-defined quartz vein, carrying a coarse-grained galena, associated with which are iron pyrites, iron carbonates, and oxides, etc. The lower, or No. 1, tunnel was in about 80 feet, for the first half of which the vein was non-productive, but the last half was found to have been stoped for a distance of 20 to 25 feet along the level, to a height of from 6 to 8 feet above the timbers. In the face of the level there was no ore visible, but a small vein of about 1 inch in width of iron pyrites continued. In 1908 15 tons of ore were shipped from the mine, running about 40 to 50 oz. of silver and 40 % lead; this ore is said to have been taken from the lower tunnel. The upper tunnel is 20 feet vertically above the lower, and has been driven in about 100 feet, cutting in its length two separate ore-bodies; the first body encountered has been stoped about 8 feet above the timbers and the second to the surface. In 1909 a shipment of 15 tons of ore was made from the mine, which contained 40% lead and 40 oz. of silver to the ton.

Lead Queen.

The *Lead Queen* mineral claim, owned by Thomas Brown, Charles Cartwright, *et al.*, is situated on No. 3 creek, a distance of twenty-three miles by trail from Botts Landing, on the Columbia river, and at an altitude of between 7,000 and 8,000 feet, or about 5,000 feet above the level of the Columbia river. The property can also be approached to within sixteen miles by a waggon-road which runs to Jas. Hearst's ranch from the town of Wilmer. From Hearst's ranch in, there is nothing more than a trail used by prospectors. The locator, Thos. Brown, has built a log cabin near the creek, at an elevation of about 5,000 feet, at the foot of the hill upon which the claims are staked and about two miles from the claims; from this cabin a trail leads up the hill to a mine cabin built at the upper edge of the timber line at an altitude of about 6,500 feet.

Upper Open Cut.—About half a mile from the mine cabin, and at an altitude of 7,500 feet, there is an upper open cut, in which the discovery was made, where considerable open work was done. There is here a fault plane following a contact between quartzite and a black slate, which has produced a crushed zone of several feet in width. The general measures are very much broken and faulted, and in the immediate vicinity of the summit, where these workings are, there are several other fissures more or less parallel, but the country is so much broken that the fissures have no continuity. In this crushed zone at the open cut there was visible, on the dump and in sight, from 5 to 8 tons of cube galena, found in irregular masses through the crushed material.

Upper Tunnel.—Approximately 100 feet down the hill from this open cut a crosscut tunnel, known as the upper tunnel, has been driven for about 300 feet, running under the showing seen in the open cut; the first 100 feet of the tunnel is in loose slide material, and after driving for 60 feet farther through rock in place, but much shattered and loose, the crushed zone already noted was encountered, after cutting through this the tunnel was driven some 120 feet in barren country rock. On the crushed zone, drifting has been done to the left for 25 feet and to the right for 110 feet, showing the zone of crushing to be well marked and regular, with a more defined mineral-bearing portion in the centre, which varied, in the height of the drift, from 2 feet at roof to 5 feet at floor, and in this there was a deposit of galena about 6 inches wide in places, though it was not continuous throughout the drift.

Cabin Tunnel.—Near the mine cabin and about half a mile from the other workings, at an altitude of 6,800 feet, a crosscut tunnel has been run in for 300 feet, from which over 100 feet of drifting had been done, but nothing of value was encountered. As far as could be learned, the tunnel had been driven to crosscut the line of strike of the vein showing in the upper tunnel, about half a mile away, and with no intermediate exposures.

LEAD QUEEN MINE, NO. 3 CREEK, WINDERMERE MINING DIVISION, EAST KOOTENAY.

WILMER. Looking south over Windermere Lake, East Kootenay.

NORTH-WEST KOOTENAY DISTRICT.

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Report of Robert Gordon, Gold Commissioner.

I have the honour to submit herewith my annual report on the progress of mining within the Revelstoke and Lardeau Mining Divisions for the year ending December 31st, 1909.

Mining throughout the entire District has been practically at a standstill during the past twelve months.

In the Lardeau Division nothing but bare assessment work has been done, and not very much of that. The holders of locations, however, have every faith in the ultimate development and success of the District as a producer, and are holding on with tenacity. It will be necessary to prove these properties before much capital can be induced to come in, and it would appear that this can best be done by the holders concentrating their energies on one or two prospects, instead of the scattered attempts now being made.

In the Revelstoke Division some work has been done in the Big Bend country, in opening up some of the mica properties; the Big Bend Mica Mines, Ltd., having employed about twenty-five men in stripping and preparatory work for three months.

The placer claims on French and McCulloch creeks also employed a few men during the whole summer, and about twenty men were taken up to the *Consolation* mine on French creek just before the close of navigation on the Columbia river, the greater number of whom remained at work all winter.

The usual small amount of work was done on the hydraulic claims, at the mouths of Smith and Camp creeks.

Nothing further has been done toward developing the mineral claims in the district north of Revelstoke.

In the eastern part of the District, formerly known as the "Illecillewaet Mining Division," a little work has been done on the *Waverley* group of claims, but nothing in the line of extensive development. The set-back given to this part of the District a few years ago by the failure of several companies operating has apparently frightened away those who might otherwise have investigated the conditions, with the object of investing in legitimate mining operations.

We are looking forward to a slight improvement in the mining industry during the coming year, though not expecting any great revival.

REVELSTOKE DIVISION.

Report of W. C. McLauchlin, Mining Recorder.

I have the honour to submit my annual report on mining operations in the Revelstoke Mining Division for the year ending December 31st, 1909.

A limited amount of development work was done.

A number of properties were bonded on which work will be done in 1910, the Government having built trails to the claims.

The Government has built a trail from the Columbia river to End creek, where the Big Bend Mica Claims, Ltd., has taken out a large quantity of first-class mica, which will be shipped out as soon as weather conditions will permit.

Considerable work has been done on the placer claims in the Big Bend district, one company keeping twenty men at work all winter.

OFFICE STATISTICS—REVELSTOKE MINING DIVISION.

Free miner's certificates issued	157
Company's certificates issued	3
Locations recorded, mineral	41
" placer	1
Certificates of work recorded	27
" improvement recorded	5
Bills of sale, mineral	10
" placer	4
Money paid in lieu of work	11
Powers of attorney recorded	3

LARDEAU MINING DIVISION.

REPORT BY B. E. DREW, MINING RECORDER.

I have the honour to submit herewith a short report of the progress made by the Lardeau Mining Division during the year 1909.

The improvement in mining conditions in this district, looked and hoped for at the beginning of the year, has not been realised, due to the fact, I venture to say, that owners of claims do not realise the necessity of personal attention to their properties. The mines which are well known are all inactive.

Prospects worthy of mention which can at the present time be acquired on favourable terms, or at reasonable prices, are: The *Lucky Jack*, *Burniere*, *Nelson*, *Stockholm*, *Spider*, *Eclipse*, *Sir Wilfred*, *Mohawk*, and the *Old Homestead* groups. These properties are all within a few miles of Camborne, which is reached by a good waggon-road from the town of Beaton, situated on the North-east arm of the upper Arrow lake.

OFFICE STATISTICS—LARDEAU MINING DIVISION.

Free miner's certificates issued	41
" " (special)	1
Certificates of work issued	89
Claims recorded	18
Bills of sale recorded	9
Agreements recorded	2
Certificates of improvement	10
Payment in lieu of work	1

SLOCAN DISTRICT.

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AINSWORTH, SLOCAN, AND SLOCAN CITY MINING DIVISIONS.

Report by E. E. Chipman, Gold Commissioner.

I beg to submit my annual report for the Ainsworth, Slocan, Slocan City, and Trout Lake Mining Divisions for the year 1909.

While there have been no important new discoveries in the District, operations have been carried on steadily, with the result that there has been an increase in the amount of ore shipped and in the values obtained. On the whole, the year can be said to have been a fairly satisfactory one to the miner, and the outlook for the future is encouraging.

AINSWORTH MINING DIVISION.

Bluebell Mine.

Operations at this mine were continued throughout the year, and there were mined and concentrated nearly 59,000 tons of lead ore, involving the constant employment of sixty-three men, including office and boarding-house staffs, etc. No important development work was done during the year, as the large amount of ore previously exposed below the adit-level is still intact. It has not yet been decided in what manner the zinc resources of this property will be turned to account, but it is expected that plans in this respect will have been matured during 1910.

United.

The *United* was bonded in the latter part of the year by the Highland-United Co. The new company has worked fourteen men steadily since taking control; has sunk 70 feet on the old shaft, continuing it to a present depth of 235 feet. As depth was obtained there was a marked improvement in the extent of the ore-bodies encountered. Eighty-five feet of drifting on the vein has been accomplished, and conditions for a large output are very favourable. A large pumping plant is being installed and the mine has been connected with the Kootenay Air Supply Co.'s plant on Coffee creek, by which power it is being operated.

The same company has also secured a bond and lease on the *Highland*, the property of the Highland (Kootenay, B. C.) Company. Since beginning operations in May, thirty-two men have been employed at the mine and eight men at the mill. The development accomplished consists of 100 feet of upraises, 180 feet of new tunnel, and 520 feet of drifting on the vein. The mill and tramway have been put in a good state of repair and 1,400 tons of silver-lead concentrates have been produced.

Maestro.

The *Maestro* worked continuously an average of three men in development and accomplished 400 feet of new work in drifting and making upraises on the vein; 65 tons of silver-lead ore were shipped, which more than paid for the work done.

Other work in the camp consisted of 100 feet of development and 11 tons of silver ore shipped from the *Number One* by one man. Two men worked two months on the *Banker* and shipped 11 tons of ore. On the *Star* 200 feet of a permanent tunnel were driven; three men were employed but no ore shipped.

WOODBURY CREEK.

The *Jessie-Blue Bird* worked four men about three months during the year and shipped 20 tons of high-grade silver ore, which netted the owner about $2,000. A car-load is ready for shipment as soon as it can be rawhided to the lake.

The King Solomon Mining Company worked a small force of men about six months on assessment work and has a car of ore ready for shipment.

SOUTH FORK OF KASLO CREEK.

On the *Cork* mine, during the year, the development consisted of 300 feet of new tunnel and 100 feet of raising. A large body of lead and zinc concentrating ore was exposed. An average of eighteen men was employed at the mine; 15,000 tons of ore were mined, of which 40 tons were shipped as crude ore and 5,830 tons were milled, from which 415 tons of silver-lead concentrates were obtained, showing that it required about 14 tons of crude ore to obtain 1 ton of concentrates. About 900 tons of zinc concentrates were also saved, but have not yet been marketed. The mill has been closed since the middle of November, on account of lack of water. Improvements in the water-supply are being made which will enable the mill to run continuously during the year.

The *Bismarck* has worked an average of four men during the year, carrying on development work, and shipped 251 tons of silver-lead ore.

The *Flint* has shipped 150 tons of silver-lead ore. On an average, three men have been employed, principally engaged in development.

Other claims on the South fork that were worked for a short time shipped ore as follows: The *Index*, 6 tons; *Gold Cure*, 20 tons; *Silver Bell*, 4 tons; *Comstock Virginia*, 5 tons and the *B. N. A.*, 3 tons.

KASLO CREEK.

The *Whitewater* and *Whitewater Deep* mines, under the same management, have employed in the mill and mine an average of sixty men continuously, milled 28,000 tons of crude ore, and shipped 3,000 tons silver-lead and 4,000 tons of zinc concentrates.

Late in the year the *Utica* group of mines was opened up, under a bond and lease, and 34 tons of silver-lead ore have been shipped. Four men are employed.

The *Wellington* was under lease the greater part of the year to two men, who shipped 28 tons of silver-lead ore, which paid considerably more than the labour and expense incurred.

Two men worked on the *Empress* the greater part of the year, and 15 tons of ore were shipped.

On the *Panama* two men worked steadily for the last half of the year in driving a crosscut tunnel and drifting on the vein. One hundred feet of work was done and 7 tons of very high-grade ore have been shipped. Cabins have been provided for housing an increased force, ore-houses and blacksmith-shop have been built, and every preparation has been made for continuous work during the incoming year.

Lucky Jim, at the head of Kaslo creek, was worked continuously during the year, with an average of 25 men. A new tunnel of 308 feet has been driven, exposing a much larger body of ore than was found in the upper workings. Five hundred feet of crosscut and raises were made during the year and 4,700 tons of zinc ore, averaging 48 % zinc, were shipped.

DUNCAN RIVER.

With the exception of assessment work and 35 feet of tunnel driven on the *Red Elephant* on Hall creek, which showed a marked improvement on the property, no work worthy of note was done on the Duncan river or its tributaries or on Hamill creek during the year.

On the Lardo river, near Gold Hill, five men were engaged in placer-mining for about two months. The worked performed was dredging and was largely experimental. There was a break in the machinery used, and it has not yet been repaired, although a stronger and better plant has been ordered. No other placer-mining has been done in the district.

The Canadian Marble & Granite Company, on the Lardo river, employed an average of 75 men during the year. Suitable buildings have been erected and first-class machinery has been put in for the manufacture of the crude material into the finest polished product. Up to date $175,000 has been expended on the plant.

Office Statistics—Ainsworth Mining Division.

Free miner's certificates (personal)	241
" " (company's)	5
" " (special)	2
New claims recorded	90
Transfers recorded	30
Certificates of work issued	356
Pre-emptions issued	10
Certificates of improvements—land, 8; mines, 33	41
Certificates of purchase	68

AINSWORTH MINING DIVISION.

Hall Creek—Upper Duncan River.

Notes by W. F. Robertson, Provincial Mineralogist.

The following are a few notes of a short trip taken to Hall creek, a tributary of the Upper Duncan river, during the month of September, 1909, by the Provincial Mineralogist, in company with the Gold Commissioner of the District and others:—

The eastern part of the West Kootenay District is marked by a deep valley depression, extending for 150 miles in a nearly northerly direction from the International boundary. The southern 90 miles or so of this depression is occupied by the Kootenay river and Kootenay lake; the northern part by the Duncan river and Duncan lake, the waters of which, flowing southward, empty into the northern end of Kootenay lake. This depression is bounded on the east by a continuous range of mountains, whose summit forms the boundary between East and West Kootenay. This range has been shown to be mineral-bearing; on its eastern slope a number of encouraging prospects have been located, and, as soon as a railway is built up the East Kootenay valley, it is probable some of these prospects will make serious shipments. The western slope of the range, in West Kootenay, is exceedingly rugged and difficult to prospect, as horses cannot be taken in, therefore, as yet, few properties have been recorded and the country has been insufficiently prospected, although it gives fair promise of mineral.

The western boundary of the depression is not so uniform as the eastern, being made up of a series of ranges, broken by gaps leading to the westward. In the southern part of Kootenay lake the western range contains numerous prospects and mines, chiefly on its western slope, as, for example, the Ymir and Sheep Creek camps, both producing gold.

Farther north, that is, north of the Kootenay arm, the western boundary range contains the silver-lead mines of the Slocan and Ainsworth Divisions, while still farther to the north and forming the western slope of the valley of the Duncan river, the range has been proved mineral-bearing on its western slope by the producing mines of the Trout Lake and Lardeau

camps, and on the eastern slope there are mineral prospects, some of which are described later. It would seem, therefore, that the northern portion of this depression forms an avenue of approach into a district of new country which, there is reason to hope, may yet prove rich in mineral, and, as such, is worthy of better transportation facilities than are at present available. As far as this valley is concerned, transportation ceases at Kootenay lake, although a railway going up the Lardo river passes within a couple of miles of Duncan (Howser) lake, with which it is connected by a good waggon-road. The river connecting Duncan and Kootenay lakes is about eight miles long, and, although fairly deep, very swift and tortuous; attempts at navigation by small steamers having proved exceedingly dangerous, it is seldom now attempted by those who know its dangers, and is not used as a route for transportation.

Duncan lake is about twelve miles long, a beautiful sheet of water, with the mountains to the west rising abruptly from its edge, while to the east, though more distant, the rugged Selkirk range, rising to glacier-covered peaks, separates this valley from that of the upper Columbia river, in East Kootenay. The lake would be navigable for any river steamer, and, above it, the Duncan river, flowing in an even course, free from rapids, is deep enough for a small stern-wheel steamer to navigate as far up as Healey's ranch, a distance of about fifteen miles; above this point the river continues for a distance of some thirty-five to forty miles, but the stream is so shallow and swift it is not navigable even by canoe. The valley of the Duncan river contains some good bottom land, while in places there is also a considerable area of hillside which could be brought under cultivation. Along the east shore of Duncan lake, and between Duncan and Kootenay lakes, a number of fine orchards have been planted, some of which are already producing magnificent fruit. At Healey's ranch, fruit, grain, and vegetables were found growing prolifically, but the lack of transportation forbade the shipment of such produce to any outside market. There is some splendid timber along the upper Duncan valley, and several patches of white pine—wood scarce in British Columbia—were noted.

The Gold Commissioner, Mr. Chipman, had planned the trip in advance, and made arrangements with the road superintendent, Mr. John Moore, and the provincial constable, Mr. William Simpson, who were both familiar with the Duncan river, to accompany the party. Leaving Kaslo at 7 P.M. on September 15th by the C. P. R. steamer, the party arrived at Lardo at 10 P.M., where the train on the Lardo and Trout Lake branch railway was found waiting. This train was taken to Howser station, some twelve miles, and, after a walk of a couple of miles from the station, Duncan lake was reached shortly before midnight, where very comfortable quarters were found in the house of Mr. Simpson, the local storekeeper and Deputy Mining Recorder. Early the next morning two canoes were obtained and a start made immediately after breakfast; the trip up the lake occupied a couple of hours and the river was entered by 10 A.M. The river was at comparatively low water, and progress was easy for the first few miles, but for the last part of the distance the canoes had to be poled most of the way. Thanks, however, to the energy and skill of Messrs. Moore and Simpson, assisted by others, the Gold Commissioner and the writer were safely transported to Healey's ranch, although they were both forced to walk for some distance along the riverside, through brush, without a trail; the party arrived at Healey's at 6 P.M., where very comfortable accommodation for the night was found. The next morning horses were obtained—Healey keeps pack- and saddle-horses for hire—and the trail followed up the western side of the Duncan river to Hall creek, and this creek was followed up to its source among the glaciers.

Hall creek, a few miles from its junction with the Duncan river, is in canyon for a couple of miles, with almost precipitous walls of limestone or quartzite; higher up, the valley is V-shaped, with no bottom land, the sides rising at an angle of about 30° to heights of from

HAMILL CREEK, AINSWORTH MINING DIVISION. Showing waggon-road leading to Earl Grey Pass.

2,000 to 3,000 feet above the valley. The Provincial Government had a party of men engaged at the canyon in blasting out the foothold for a trail along the rocky face of the cliff, and by the end of the season the work should have been nearly completed; Hall creek will then be equipped with a good and permanent trail, which should keep in repair for years with little further expense.

The trip by pack-train from Healey's to the Government road camp at the canyon, on Hall creek, occupied a day. Here some of the party were accommodated with bunks by the road foreman, while the others pitched a tent on a wide part of the trail-bed, the only spot of comparatively level ground near by. On September 18th the party left the road camp at 8 A.M., and by noon had reached timber-line on the mountains, about two miles below the *Wagner* group of mineral claims. This was as high as horses could be brought, the rest of the distance being over glaciers, deeply fissured and covered by a recent fall of snow. That afternoon the workings on the *Wagner* group, on the Hall creek slope, were examined and the night spent on the mountain at the upper edge of timber-line.

On the morning of September 19th the mountain was descended to the valley of Hall creek and camp made at the *Red Elephant* mineral claim, which was examined that afternoon.

On Monday, September 20th, the camp was sent to the road camp again while the writer proceeded up to the *Bannockburn* group, a two hours' climb up the mountain, examined that mine and returned at night to the road camp.

The next day the horses were taken back to Healey's, where the night was spent, and on the following day, September 22nd, the canoes were taken down the Duncan river to Howser, arriving there about noon, from which place the train was taken back to Lardo, connecting there with the boat for Kaslo, which was reached by midnight, the trip having taken just one week.

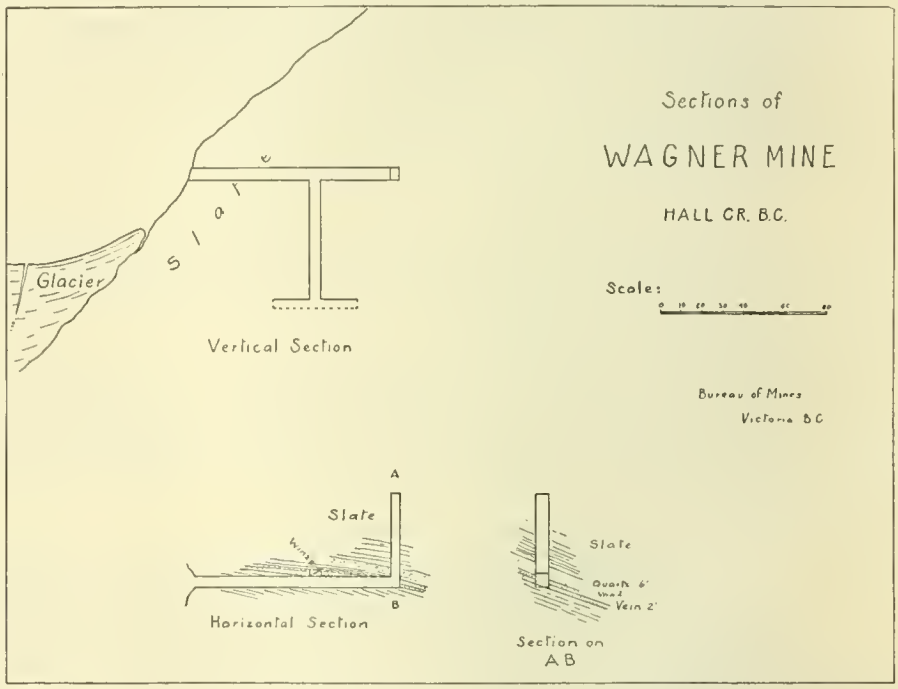
The following is a brief description of the claims visited :—

Wagner Group.

The *Wagner* group consists of three claims, the *Lardo*, *Duncan*, and *Ella*, originally owned by Messrs. Johnson, Rugh, and Porter. The group is situated on the very summit dividing Cariboo creek, in the Trout Lake Division, from Hall creek, in the Ainsworth Mining Division, and at an altitude of 8,400 feet, placing it among the highest of the mineral claims recorded in the Province. These claims were reported on by this Bureau in 1897.

The *Duncan* claim is in the Ainsworth Division, and on it the principal development has taken place. The work done consists of a tunnel driven in for 100 feet from the outcrop, along the strike of a vein of white quartz in a slate formation; from the inner end of the tunnel a crosscut has been made to the left for 45 feet, in which, at a distance of 60 feet from the portal, a winze has been sunk below the tunnel, which is said to have been put down 60 feet, with drifts of 20 feet each way from its bottom along the vein, but as the winze was partly filled with water, these statements could not be verified. The tunnel follows in a well-defined vein of white quartz, about 2 feet wide, carrying a percentage of galena, alongside of which is a band of quartz about 4 feet wide, not as clear quartz and containing some slate, etc., probably a crushed zone, while again adjoining this, exposed in the crosscut, is a band of mixed slate and quartz about 6 feet wide. The 2-foot band contains some bunches of clean galena ore, which might be sorted out were transportation facilities available. In the 4- and 6-foot bands there is a small percentage of galena, estimated at from 5 to 10 %, so finely divided as to be available only by concentration. Samples of the galena assayed about 70 % lead and 100 oz. silver, while samples showing tetrahedrite are reported as running as high as 240 oz. in silver.

The tunnel is driven in a N. 50° W. direction into a small knoll, or peak, protruding through a perpetual glacier which extends, a field of ice fissured by deep crevasses, for a distance of nearly a mile down the Hall creek slope. Should ore ever be shipped from the property, it will be taken out by Hall creek, as the trail to Trout Lake is twenty-four miles long and crosses two divides. The transportation problem from the present workings appears to offer serious difficulties, as it is two miles down the steep valley, half the way over a glacier, to the nearest timber, and in the first half-mile there is not a place where a tower for an aerial tram could be placed so as not to be swept out by the glacier or covered by snow-slides from the adjacent "lime-dyke."



The camp from which the work was done and where the writer camped is two miles below the workings, and at about 2,000 feet lower elevation. The trail from the camp to the workings zigzags up a steep hill, covered for the greater part of the year by snow-slides, then climbs up the talus of the glacier to a field of ice nearly three-quarters of a mile wide, cut by deep crevasses, which, when covered by fresh snow, offer death-traps to the unwary. This the writer realised when a large collie dog that accompanied the party, playing on a smooth field of snow, suddenly disappeared, and was only recovered by the owner, Hugh McKay, insisting upon being lowered down by a rope 20 to 25 feet into a crevasse in the green ice of the glacier.

Bannockburn Group.

The *Bannockburn* group consists of seven Crown-granted mineral claims, owned by the Bannockburn Mines, Ltd., with head office in Kaslo, B. C., and is situated in Bannockburn basin, at the head of Hall creek, a tributary of the Duncan river. The property is at the upper edge of timber-line, overlooking the valley of Hall creek, and is about 1,000 feet to the south of the great so-called "Lime-dyke," which forms such a marked feature in the topography of the Lardeau District. Immediately to the south of the lime-dyke lies a belt of schist formation about 1,000 feet wide, and to the south of this there is a bed of very white crystalline limestone. On the

contact between the schist and limestone is the vein which gives value to the property. This contact is quite well defined, and has a strike of S. 60° E., with a dip to the north, the angle of which could not be determined from any of the development workings or exposures.

The development workings consist entirely of open trenches, stripping the outcrop at various places over a length of about 200 feet of the outcrop, and a winze, said to be down 30 feet, but which could not be examined; the tunnel driven lower down is not considered as development workings, as will be explained later. There are a number of these open trenches which are somewhat caved in, but the Provincial Mineralogist had three sufficiently cleared out to expose a cross-section of the ore-deposit; these exposures were accurately measured with a steel tape, and a "cold-blooded" sample taken of the fresh-chipped surface all the way across the measured exposure. The measurements and assays of the samples were as follows:—

Open Pit A—Surface exposure of 48 inches solid galena, sampled across, and assaying: Lead, 55%; silver, 27.6 oz.; gold, $2 to the ton.

Open Pit B—Surface exposure, 36 inches solid galena, sampled across, assayed: Lead, 46.9%; silver, 22.8 oz.; gold, $2 per ton.

Winze C—About 30 inches galena.

Open Pit D—32 inches solid galena.

The outcrop was originally covered by from 2 to 4 feet of surface soil, through which these trenches have been dug. These exposures demonstrate the outcrop of an ore-body, of width and assay indicated above, for a length of 150 feet, but how much farther it extends is not proven, as no work has been done to demonstrate whether it does or does not continue.

About 500 feet to the north-west, and nearly in line with the strike of the exposed outcrop, there is, at the edge of a glacier, in a small cave on a fissure, a showing of galena which the owners hope and think is a continuation of the lead, but this has not been proved as yet, and the showing on the property is quite good enough to eliminate anything unproven. The outcrop occurs on a comparatively flat bench, and a few feet to the south from the outcrop the hillside drops off very abruptly. Into this abrupt face, at a point about 80 feet lower than the outcrop, a crosscut tunnel has been driven in white limestone for 85 feet, when a crack in the limestone, running parallel with the line of outcrop, was struck, and this crack was followed for 130 feet to the left (N.W.), at the end of which drift the measures were further crosscut for 15 feet. There is nothing to be seen in the tunnel, or drift, but white crystalline limestone, and, as far as developing the property is concerned, it is useless. As already said, the ore found is on a contact between this lime and a band of schist, and it would seem, therefore, that the tunnel should be driven in until this contact at this depth is reached, or until it is proved where the contact is, and connection should be made between the tunnel workings and the winze put down on the outcrop. The outcrop described is unusually good and encouraging, and it is to be regretted that more work has not been done on the property; it is too good to stand as only a prospect.

Just at timber-line a small, but sufficient, log cabin has been built for the men, but no work has been done on the property for some time.

It is quite a drop from the claim down to the valley of Hall creek, but a straight course and uniform grade could be had for an aerial tramway about half a mile long.

The Provincial Government has just about completed, at a heavy cost, a good and serviceable trail up the valley of Hall creek, and it is probable that before long a waggon-road, or railway, will be built up the valley of the Duncan, but until there is some further development of the various prospects, additional expenditure would be unwarranted.

Red Elephant.

The *Red Elephant* group of four claims, owned by Hugh McKay *et al.*, is situated at an elevation of 4,450 feet on the hillside on the north side of Hall creek, just below the mouth of Bannockburn creek, or ravine. The property is an exceedingly interesting one, inasmuch as some quite high assays in gold have been had, while some very low assays are obtained from seemingly the same material. The chief development consists of an adit tunnel driven in a loose, decomposed schist for 55 feet in a N. 30° W. direction, when the tunnel branches into three drifts, the total workings amounting to from 125 to 150 feet, all in schist country rock. A sample taken from the face of the middle drift gave only a trace of gold and silver, while the left-hand drift gave $2.40 in gold to the ton.

Cutting across this schist, but in a general east and west direction, there is a quartz vein, very poorly defined, as the flakey nature of the enclosing rocks permits it to spread and so gives the vein the appearance of bunches of quartz, more or less in line. This vein crossed the tunnel near its mouth, and it was here that the highest assays have been obtained. A sample taken from the outcrop of this vein, as it runs over a bluff to the east of the tunnel, gave, upon assay, $19.20 in gold; so it seems highly probable that the mineralisation of the schist took place from and along this quartz vein, extending therefrom into the country rock. The property is worth further investigation, although, as yet, no body of commercial ore has been discovered.

SLOCAN MINING DIVISION.

REPORT BY ANGUS MCINNES, MINING RECORDER.

I have the honour to submit herewith my annual report on the mining operations in the Slocan Mining Division for the year ending December 31st, 1909. A great deal of development work has been done during the year, and indications from all parts of the camp show that greater activity will prevail during the coming year.

Van-Roi.

The *Van-Roi* mine is situated on Four-mile creek, about four miles from Silverton, and is operated by an English syndicate, with Douglas Lay as manager. This mine is the biggest employer of labour at present in the Slocan, having upwards of eighty men employed. During the year there has been run 1,376 feet of tunnel and 126 feet of crosscut tunnel, 260 feet of raise, 70 feet of sinking; there has been mined 1,390 tons of silver-lead ore and 1,396 tons of zinc ore. A fine compressor has been installed, and, I understand, plans are being prepared for a large concentrator, to be built on Four-mile creek, on which operations will commence early in the spring.

The Standard Group.

This group is owned and operated by Geo. Aylard, of New Denver, John A. Finch, of Spokane, and associates, who employ eighteen men on an average, and are shipping a great deal of silver-lead ore and some zinc ore. The building of a mill to concentrate the ores is contemplated. The *Hewitt* mines—also on Four-mile creek, about four miles from Silverton—of which Geo. Stilwell is general manager, for the last six months has only been doing development work, with a view of blocking out bodies of ore for shipment in the near future. The *Mollie Hughes* group of mines, situated on the edge of the townsite of New Denver, is a dry-ore proposition carrying about 200 ounces in silver and $7 to the ton in gold, and is owned and operated by Michael Zatoni, who employs twenty men on an average, and is shipping about 20 tons of ore a week, as well as keeping development work well ahead; he is also planning for a compressor plant for the spring.

LIME DYKE. Looking down Hall Creek, Duncan River, West Kootenay.

LIME DYKE. Looking down Hall Creek, Duncan River, West Kootenay.

The *Richmond Eureka* group, situated about two miles above Sandon, is owned and operated by the Consolidated Mining and Smelting Company of Canada, with W. A. Davis as manager, employs twenty men, and is constantly shipping silver-lead ore.

Rambler-Cariboo.

The *Rambler-Cariboo* mine is situated in McGuigan basin, just above McGuigan, a town on the Kaslo and Slocan Railway. The property is owned and operated by the Rambler-Cariboo Mines, Ltd., a joint-stock company with headquarters in Spokane, and an office in Kaslo, B. C. Mr. W. H. Zwicky, of Kaslo, is manager and engineer. The property was formerly an extensive shipper of silver-lead ore, and paid a large amount of money in dividends, but for the past few years has made a diminished output, owing to the fact that a long development tunnel was being driven to tap the lead below the old workings. This tunnel has now been completed and the ore-body found at the increased depth, so that in the future it is expected the mine will again make important shipments of ore.

Note by Provincial Mineralogist.—The following notes indicating the present status of this property have been kindly contributed by Mr. E. Jacobs:—

"Reports of recent discoveries of new chutes of ore in the *Rambler-Cariboo* mine have renewed interest in that property, concerning which the following information is believed to be dependable:—

"The company, incorporated on July 31st, 1899, as the Rambler-Cariboo Mines, Limited, has its head office in Spokane, Washington, and its British Columbia office at Kaslo. Mr. W. E. Zwicky is manager. The company's property embraces five mineral claims, having a total area of 175 acres, situated in McGuigan basin, Slocan Mining Division, and distant about three miles from the Kaslo & Slocan Railway. Prior to 1904 development work consisted chiefly of a shaft with levels opened from it. This shaft was sunk from what is known as the 300-foot level, the original workings, down to 300 feet, having been adits driven in the mountain-side above. The shaft was sunk 500 feet, and levels were opened at 100 feet intervals down to what is called the 800-foot level, below which depth it was not practicable to work the mine with the power plant with which it was then equipped, for in the spring of each year pumping especially would have been too heavy for the available power. By that time much ore had been extracted, and from the profits earned $230,000 in dividends had been paid to stock-holders. At the beginning of 1904 the directors found themselves in this position—they had to choose between buying and putting in a larger power plant, driving a long adit to cut the vein at a deeper level, and so provide for the drainage of the mine at little or no cost after the vein should have been intersected by such deep-level working, or abandoning the mine. Another consideration was the altitude of the surface works—concentrating-mill, mine buildings, etc.—which was about 6,000 feet above sea-level, at which height snow-slides were troublesome.

"Mr. Zwicky strongly recommended the driving of a deep-level adit, and eventually he was authorised by the directors to proceed with this important work, which was commenced on July 9th, 1904, and completed on April 16th, 1906. The portal of the adit is at an altitude 1,450 feet lower than that of the lowest outcrop of the vein, 2,400 feet below the apex outcrop on the summit of the mountain, and 650 feet lower than the 8th or former bottom level of the mine. At 4,523 feet from the portal driving was discontinued. Allowance having been made for the running-off of water, the depth at the face of the adit is 1,425 feet below the lowest outcrop. I have stood at the face and from there seen daylight at the portal, distant nearly seven-eighths of a mile. The excellence of the engineering and workmanship in driving this adit, which is 7 feet by 7 feet 6 inches in the clear, was therefore plainly evident.

"Writing of conditions as he found them about the close of 1907, Mr. Robert R. Hedley, in his description for the Dominion Department of Mines' 'Report on the Mining and Metallurgical Industries of Canada, 1907-8,' observed: 'The manager of the *Rambler-Cariboo* mine states that owing to some disturbance, or fault, at or about the point to which the vein had been projected on this level, the vein was not found, though the tunnel was driven for some 90 feet beyond. He consequently concluded to cut the vein at the nearest possible point under the main shaft. A diagonal drift was then run, and from this drift a raise made to connect with the upper workings. In 200 feet of raise the 1,250-foot level was reached and a crosscut started, which, after being driven 47 feet, cut the vein. It was there 8 feet wide and showed several streaks of clean galena. Raising was continued, and some driving done at the 1,150-foot level. Stations were established at the 9 and 10 levels. Some stoping was then undertaken in the upper levels, and the work of connecting the tunnel by a suitable shaft proceeded with. The necessary equipment of the portal was installed, and suitable cottages, bunk-houses, etc., for the new camp near the mouth of the tunnel, were erected.'

"When in the Slocan last January I was informed that the 900, 1,000, and 1,100 levels had been opened, and ore had been found in several places down to the 10th level. The ore was silver-lead, with but little zinc. Here it may be mentioned that during the period from 1893 to 1906, inclusive, shipments of ore from the mine aggregated about 14,500 tons of the following average metal contents: Lead, 37 %; zinc, 14 %; and silver, 127 oz. per ton. The output in 1909 was in excess of 1,000 tons of a somewhat lower grade than the average above stated, yet sufficiently high to pay mining costs and as well provide enough money for exploration included in the 1,200 to 1,300 feet of development work done. Latterly production has been maintained at the rate of about 100 tons per month, and it is well known that recent discoveries of ore have been such that a larger output could be regularly maintained without difficulty, were it considered advisable to increase production while prices of silver and lead continue to be comparatively low.

"Only last week the Kaslo 'Kootenaian' stated that it had learned from a reliable source that another big strike of ore had been made in the *Rambler-Cariboo*. 'This time,' said the 'Kootenaian,' 'it is from No. 9, and is a continuation of the vein recently cut into in No. 8, connection having been made through. The vein shows more that 2 feet of solid shipping ore, giving the property an immense ore reserve and extensive stoping ground. It will be a cheery report that Manager Zwicky will present to the directors at the annual meeting of the company, to be held in Kaslo about the middle of next June.'

"There is no doubt that the *Rambler-Cariboo* is now in better condition to return substantial profits above operating costs than at any other time for years. The successful outcome of the enterprise planned six years ago by Mr. Zwicky, whose wise foresight was not at that time generally recognised, is of much moment to the Slocan District as a whole; indeed, this has been recognised by other mine-owners, for at least two other deep-level developments have been carried out, one also with gratifying success and the other with good prospects of also justifying the enterprise with which it has been undertaken. Recognition of the pluck of the directors of the Rambler-Cariboo Company, themselves large stockholders, in financing what at first seemed a somewhat hazardous as well as costly undertaking, is also merited. They had faith, though, in their manager's skill and good judgment, and the sequel has proved that it was well grounded."

Slocan Star.

The *Slocan Star*, near Sandon, is again about to start operations after about seven years of idleness caused by litigation; the parties thereto have at last come together and made a final settlement. The mine is owned by the Byron N. White Co. of Spokane, and O. V. White is general manager.

Noble Five. The *Noble Five* group, situated above Cody, is owned and operated by the Hon. James Dunsmuir, of Victoria, who had a small force of men doing development work, and they have already struck bodies of silver-lead ore. T. L. McAllister is manager.

Payne Mine. The present owners of this old mine have been putting down diamond-drill holes below the old lower levels, and I am informed by the manager that bodies of high-grade ore have been encountered and that it is the intention of the owners to put a force of men at work to prove these indications.

The *Ruth* mine, situated at Sandon, and operated by Geo. Alexander, of Kaslo, with D. McKenzie as manager, has been working a force of about ten men, and is constantly mining and shipping ore.

The following properties have been doing more or less work during the year: *McAllister*, on the North fork of Carpenter creek, Geo. Clark, manager; *Rio*, in McGuigan basin, W. H. Zwicky, manager; *Mountain Con*, above Sandon, B. Bennett, manager; *Silver Bell*, Silver mountain, H. Lowe, manager; *Idaho*, T. Avison, manager.

Office Statistics—Slocan Mining Division.

Free miner's certificates issued	158
Free miner's certificates (company)	3
Mineral claims recorded	30
Assessments recorded	140
Conveyances and agreements	8
Traders' licences	34

SLOCAN CITY MINING DIVISION.

Report of Howard Parker, Mining Recorder.

I have the honour to submit my report for the Slocan City Mining Division for the year ending December 31st, 1909.

The past year has shown a marked improvement in mining operations in this Division, and the output is considerably in excess of the year 1908.

The *Westmont* group, situated at Ten-mile, has been the most active mine in this Division, from fifteen to twenty men having been engaged on the property the entire year. A good body of ore has been found in No. 3 tunnel: about 400 feet of driving has been done in No. 4 tunnel, and 200 feet of an upraise from No. 5, to connect with No. 4 tunnel, exposes ore continuously. The company shipped, in all, some 200 tons of ore, averaging 160 ounces of silver per ton.

The lessees of the *Ottawa* mine shipped some 450 tons during the year. A further lease has been obtained on the entire workings.

The *Hamilton* group, situated at Twelve-mile creek, has been bonded to the Hewitt Mines, Limited. Some three or four men are now engaged opening up the property.

The *Meteor*, adjoining the *Howard Fraction*, shipped 14 tons of ore.

On the *Pay-day* some work has been done this year, and 8 tons of ore shipped.

The owners of the *Howard Fraction* have suspended operations temporarily, and intend leasing the property.

OFFICE STATISTICS—SLOCAN CITY MINING DIVISION.

Free miner's certificates (ordinary)	85
" " (company)	2
Certificates of work recorded	128
New locations recorded	62
Conveyances recorded	16
Certificates of improvements recorded	12
Cash paid in lieu of work	$400

TROUT LAKE MINING DIVISION.

REPORT OF F. MUMMERY, ACTING MINING RECORDER.

I have the honour to submit herewith my report of the progress of the mining industry in the Trout Lake Division for the year 1909.

During the past year there has been no material change, either in the number of mines producing or in the number of men employed, and the production shows an increase, over that of 1908, of 135 tons. One new company has been formed and is engaged in developing its property with apparent success, but the low price of silver prevailing during the year has made the profitable operation of any but high-grade properties very difficult.

Silver Cup.

The *Silver Cup* mine, situated on the South fork of Lardeau creek, has been in nearly continuous operation since 1894, and is still the most important producer in the Division. The property is now owned by the Ferguson Mines, Ltd., and has this year, under the superintendence of F. C. Merry, been employing an average of fifty-four men, and has made an output of 1,639 tons of ore, as well as doing development work, consisting of drifts and crosscuts, to the extent of 978 feet.

NOTES BY PROVINCIAL MINERALOGIST.—The following notes regarding this property have been supplied by Mr. E. Jacobs:—

"The Ferguson Mines, Limited, has its head office in London, England. Mr. George Alexander, of Kaslo, B. C., is general manager, and Mr. F. Chas. Merry, of Ferguson, superintendent of the mines, which are in Trout Lake Mining Division. The company owns two groups of mineral claims. The *Nettie L.* group comprises eight claims and fractions, of a total area of 252 acres; it is situated on a spur of Ferguson mountain, about 5,100 feet above sea-level and 3,100 feet above the town of Ferguson. The *Silver Cup* group consists of nine claims and fractions, area 185 acres, situated on the north slope of Silver Cup mountain, south of the South fork of Lardo creek, and distant in a direct line about six miles from Ferguson. The altitude of the *Silver Cup* mine is 6,500 to 7,000 feet above sea-level.

"More than one mile of underground development work has been done on the *Nettie L.* group, and three main ore-bodies, known respectively as the main lead, the cross lead, and the big quartz vein, have been opened. Four levels have been run on the *Nettie L.* and three crosscut tunnels driven on the *Ajax* claim, one of the group. The ore consists of quartz, usually heavily mineralised with tetrahedrite, galena, sphalerite, and some copper and iron pyrites. No information is available as to the total tonnage of ore shipped from this mine, but it is on record that from February, 1900, to June 30th, 1903, 2,298 tons were shipped, which returned $121,761 net cash from the smelter, after deduction of freight and treatment charges. Average valuable metal contents were: Gold, 0.13 oz.; silver, 149.6 oz. per ton; and lead, 26.7 per cent. Only first-grade ore was shipped, leaving about 4,000 tons of second-grade ore on the dump for mill treatment. An aerial ropeway, nearly 8,000 feet in length,

was constructed in 1903, to connect the mine with the company's mill at Five-mile on Lardo creek, which flows in the valley between Ferguson and Silver Cup mountains. The *Nettie L.* mine has not been worked during recent years.

"The *Silver Cup* has been an ore-producer for nearly fourteen years, its first shipment having been made in the second half of 1896. The development work done in this mine totals approximately 10,000 feet. The ore is of a similar general character to that occurring in the *Nettie L.* mine. The ore chutes in the old *Silver Cup* workings, which are the upper levels of the mine, have been practically exhausted; later development work has been below the *Sunshine* tunnel, which cuts the *Silver Cup* lead at about 750 feet below its outcrop. Ore has been extracted from this lead down to a depth of nearly 1,000 feet, or about 250 feet below the lower or main *Sunshine* tunnel, which has been driven 1,800 feet into the mountain. At 230 feet vertical depth below the lower *Sunshine* tunnel another adit has been driven, to cut the *Sunshine* lead at 650 feet from the portal of this drive. Ore production is maintained at the average rate of nearly 140 tons per month of a shipping product which runs generally from 0.4 to 0.5 oz. gold and 100 to 120 oz. silver per ton, and from 28 to 30 per cent. lead. Last year's output was rather less than 1,700 tons, as compared with 1,593 tons in 1908. The underground development work done in 1909 was 975 feet, all drifting and crosscutting. An 8 by 10-inch double-cylinder geared hoist was placed in the lower *Sunshine* tunnel last year, to facilitate the work of sinking the winze below the 10th level, which winze had already been sunk 200 feet in the *Silver Cup* lead. The mine force usually numbers about forty men.

"When, in 1903, a 16 by 18-inch air-compressor was taken up on the aerial tramway and installed at the *Sunshine* mine, it was stated to be the only engine of that kind working in the Province at so high an altitude. A 45 horse-power boiler supplied steam for operating the air-compressor, a hoist, and a pump. Communication between the mine and the waggon-road, is by aerial tramways, of which there are two—one from the portal of the lower *Sunshine* tunnel to the lower terminal at Eight-mile, a distance of nearly 8,000 feet, and another about 16,000 feet down Lardo creek to Five-mile. The longer tramway was constructed for the purpose of conveying ore from the *Silver Cup* and *Sunshine* to a mill erected in 1903 at Five-mile, about a mile up Lardo creek from Ferguson, but the mill process—combined concentration and chlorination—did not prove successful, so shipment to the smelter of the higher-grade ore was resumed, while all second-class ore was placed on the dump until such time as its treatment can be profitably undertaken.

"The *Silver Cup* is the only mine in the Lardeau country that has been practically continuously operated ever since mining was commenced in that part of the Province, and its success over a comparatively long period may be attributed chiefly to competent management and systematic working."

True Fissure. This property, comprising nine claims situated on Great Northern mountain, and about five miles from Trout Lake, is owned by the True Fissure Mining & Milling Co., C. H. Woolley, of Trout Lake, being the local representative of the company. The property was worked during the early part of the year under lease and 134 tons of silver-lead ore shipped to the smelter. Since the lessees ceased work the property has been idle, but the company is now considering plans for the erection of a 100-ton concentrating plant and an aerial tram to connect the mine with the proposed mill, work on which they expect to commence as soon as weather conditions in the spring will permit.

Winslow. The *Winslow* group, situated at the head of Seven-mile creek, was being worked under bond by A. C. Merrill, of Tacoma, Wash., and large bodies of ore opened up, the grade of which was stated to be satisfactory.

A good trail from the lake shore to the mine has been completed and considerable preliminary work towards the erection of a mill has been done, but about the middle of November work was closed down and further operations are not expected to be resumed until spring.

Broadview. This property, situated on Great Northern mountain and owned by the Ohio Mines Development Co., after being idle two years, is now being worked under lease by Houston, Daney, *et al.* Since commencing work in November, one 30-ton car of silver-lead ore has been shipped and another car-load is now being rawhided down; four men are being employed on lease.

Ethel Group. This property, comprising the *Frances* and *Noel* mineral claims, is situated on Ethel mountain, overlooking and about three miles and a half from the town of Trout Lake, was recently taken over by a company, operating under the name of The Ethel Silver Mining Co., with head office in Spokane, Wash. Since operations were commenced, on November 1st, a considerable quantity of ore has been extracted, and two car-loads have been rawhided down and are now awaiting shipment. A small shipment of about 1,300 lbs. was made by the former owners last January. A force of five men is employed at the mine.

Senorita. The *Senorita* group, consisting of four claims, situated on Canyon creek about one mile and a half from Gerrard, is owned by Rady, Barber, and Hillman. Over 100 feet of development work has been done on the property during the year, and a good chute of high-grade ore exposed, but the owners will not attempt to make any shipment until next summer, when they hope to have a practicable trail to the property completed.

OFFICE STATISTICS—TROUT LAKE MINING DIVISION.

Free miner's certificates issued to individuals	110
" " " companies	5
Mineral claims recorded	63
Certificates of work issued	198
Certificates of improvements recorded	5
Bills of sale, agreements, etc., recorded	36
Grouping notices filed	37

NELSON DISTRICT.

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NELSON MINING DIVISION.

REPORT OF W. W. BRADLEY, ACTING GOLD COMMISSIONER.

I have the honour to submit my annual report on the Nelson Mining Division for the year ending the 31st December, 1909 :—

The activity in mining throughout the entire district has greatly increased during the past year, and many new properties have begun shipping ; these, with the increased output from the older mines, have raised the production 45 per cent. higher than in 1908. To this increase the *Nugget* gold-mine, at Sheep creek, contributed about $100,000, while the *Yankee Girl*, at Ymir, which was not a producer in 1908, added about $64,000. The *Mother Lode* and the *Kootenay Belle*, both in the Sheep creek camp, and the *Emerald*, at Salmo, the largest producer of lead in the Nelson Division, were other mines that added their respective shares to the total increase. The *Silver King* and the *Granite-Poorman* made an appreciably larger production in 1909 than in 1908. The *Arlington*, at Erie, showed a steady, though small, increase. The *Queen Victoria* and the *La Plata* (formerly the *Molly Gibson*) were not operated during the year, the former owing to the low price of copper, and the latter owing to financial difficulties. The *Eureka*, although not a shipper this year, was in operation, and a great deal of work was done in driving tunnels and sinking shafts, so that a great quantity of ore is now blocked out and the mine is in excellent shape for a good year in 1910. In only a very few mines in the Division was there a decrease in output.

During the year the *Yankee Girl* group was transferred to an active operating company, a decided change for the better. The *Athabasca*, on Toad mountain, was reopened ; an active local syndicate having acquired possession of the mine and stamp-mill, set about proving that confidence in the old mine was warranted ; a good ore chute has been found, and the outlook for a successful shipping season next year is assured. Local men have also taken over the *Fern* under lease and bond, and work has been commenced. The *Alma M.*, in the vicinity of Eagle creek, was bonded in the fall by Coast mining men, who at once commenced development work. The *Alice* mine, near Creston, was also bonded by local mining men, but did not prove successful. The *Silver King* mine, south of Nelson, suffered considerable loss by fire which destroyed part of the surface works, causing a suspension of ore production for about two months, after which it was again practicable to send ore down to the railway, and shipping to the smelter at Trail was resumed.

Arlington.

The *Arlington* mine, located about three miles from Erie, on the line of the Nelson & Fort Sheppard Railway, is owned by the Hastings (B. C.) Exploration Syndicate, Limited, and has been operated by them for over eight years without a shut-down of a single day. It is considered to be one of the safest mines in the country, nothing being overlooked for the absolute safety of the employees. The mine has its own water-works and electric light system. During the period ending February 28th, 1910, more ore was shipped to the smelter than during the previous year, and everything is favourable for still heavier shipments during the coming year.

Sheep Creek.

Sheep creek has been the centre of great activities during the year, a number of claims having been developed; the properties in actual operation have made increased shipments and many improvements at the mines.

Nugget.

The *Nugget* mine, owned by the Nugget Gold Mines, Ltd., has been operated during the whole of the year 1909. The 4-stamp mill ran steadily, crushing from 400 to 450 tons of ore per month, averaging a price of about $20 per ton. There was recovered from the ore by amalgamation about $15 per ton, while the monthly production of concentrates averaged in value $90 per ton. The rich ore and concentrates are all shipped to the smelter at Trail. In the early part of the year, during the rawhiding season, 3,455 tons of crude ore were shipped to the smelter, and averaged $115 per ton. The mill consists of two batteries of two stamps each (Hendy type), triple discharge, with the usual silver-plated copper amalgamating plates, below which is a Pierce amalgamator. Two 6-foot Frue vanners constitute the concentrating department. The mill is operated during the spring and summer months by water-power, and in the fall and winter by steam-power. The milling plant is only a temporary one, for use during the early development stage, and will soon be replaced by a larger one. A 2-bucket aerial wire-rope tram, 1,500 feet long, is used to transport the ore from the mine to the mill. At the mine during the year 1,300 feet of underground development work was done, which, with the exception of about 500 feet, was all on the vein and in ore. The total development to date is now over 2,000 feet, distributed on four adit-levels—Nos. 1, 2, 3, and 4. No. 4 will give a vertical depth of over 500 feet below the apex of the vein. Besides the main No. 1 vein, there has been discovered three parallel veins, two of which show every indication of proving equally as valuable as the No. 1. One of the parallel veins now being developed produces ore of equal value, at a depth of over 250 feet. The other veins will be opened up as the development of the mine proceeds.

Emerald.

The *Emerald* mine, on June 7th, was placed in the hands of a company called the Iron Mountain, Ltd., with John Waldbeser as manager, with head office at Salmo. The mine was in operation during the entire year, employing on an average six men, who were paid $3.50 and $4 per day. The development work consisted of drifting 190 feet, sinking 90 feet, raising 83 feet, and crosscutting 130 feet. Ore was mined to the extent of 1,425 tons, of which 1,068 tons were shipped. The ore shipped realised a net smelter value of $5,714, the metal contents being 764,292 lbs. of lead and 1,628 oz. of silver. Besides the above work in the mine, there was work to the extent of about $1,000 done in improving the buildings, etc.

Kootenay Belle.

The *Kootenay Belle* mine, at Salmo, was in operation nearly all the year. From January 1st until February 13th the 4-stamp mill was run steadily, with an average of 16 men working at the mine. The work was stoping from No. 1 and No. 2 veins, running a drift on vein No. 1, west of main tunnel, a distance of 35 feet, and raising 20 feet to connect with upper workings, thus stoping off a block of ground 20 feet long and 15 feet deep. On vein No. 2, a block of ground 20 feet long by 30 feet deep has been stoped out on the east side of the main tunnel. A shaft was also sunk on vein No. 1 from 35 to 48 feet deep, and a block of ground stoped out 40 feet long and 40 feet deep. From February 14th to April 15th an average of 13 men were employed drifting off shafts on vein No. 1, 20 feet to east and 17 feet to west.

The McMartin tunnel, which will tap No. 1 vein 200 feet below the present level, was driven 115 feet. On May 15th the mill was again put in operation. The operations at the mine consisted of running a drift of 85 feet east on No. 1 vein, and a raise of 50 feet to the

LOOKING UP SHEEP CREEK FROM QUEEN MINE AT MOUTH OF WOLF CREEK.

surface, with a stope out of 15 feet on each side of raise. Another block of ground, 25 feet long by 25 feet deep, was stoped out on vein No. 2, and a drift of 55 feet was driven on vein No. 1, east of the main tunnel.

Vancouver.

The *Vancouver* mine, owned by George H. Fisher and Frank Unfried, of Nelson, B. C., was operated by the owners in November and December. One ore chute which was uncovered on this property has been traced 500 feet, and on this the work was commenced November 1st. A tunnel was driven for about 60 feet and the ore followed to the surface; practically no stoping was done. While driving the tunnel, a carload of ore weighing 22 tons was taken from the ore chute, the smelter returns from which were 5.08 oz. gold per ton and 1.2 oz. of silver, giving a gross return of about $102.22 per ton. It is expected that considerable ore will be shipped from this property during the coming year, as a large quantity of good milling ore lying alongside the ore chute is now being worked.

Granite-Poorman.

The *Granite-Poorman* mine, still under lease by Messrs. Gough, Guille and Swedberg, has had a very successful year, and a great deal of development work has been done, particularly on the *Granite*. A tunnel 800 feet in length was driven to unwater the mine, while another was also started on the vein at a depth of 200 feet below the present workings and run for a distance of 400 feet, with good results; a total of 3,000 feet of development work. The $\frac{5}{8}$-inch steel cable on the aerial tramway was replaced by a $\frac{3}{4}$-inch plough-steel cable; a number of alterations were made at the mill, and new ore-bins at the mine. These improvements amounted to $5,000. Although the shortage of water hindered operations in the early part of the year, yet, in spite of this, something over 10,000 tons of ore were mined and milled, which gave a gross return of $72,000. The mine and equipment are now in excellent shape, so that the prospects are the very brightest for the next year's operations.

Office Statistics—Nelson Mining Division.

Total live claims (not Crown-granted)	1,020
Total live claims (Crown-granted)	710
Claims worked, 1909	381
Assessments recorded	550
Transfers and agreements	216
Free miner's certificates	728
" " special	4

Revenue.

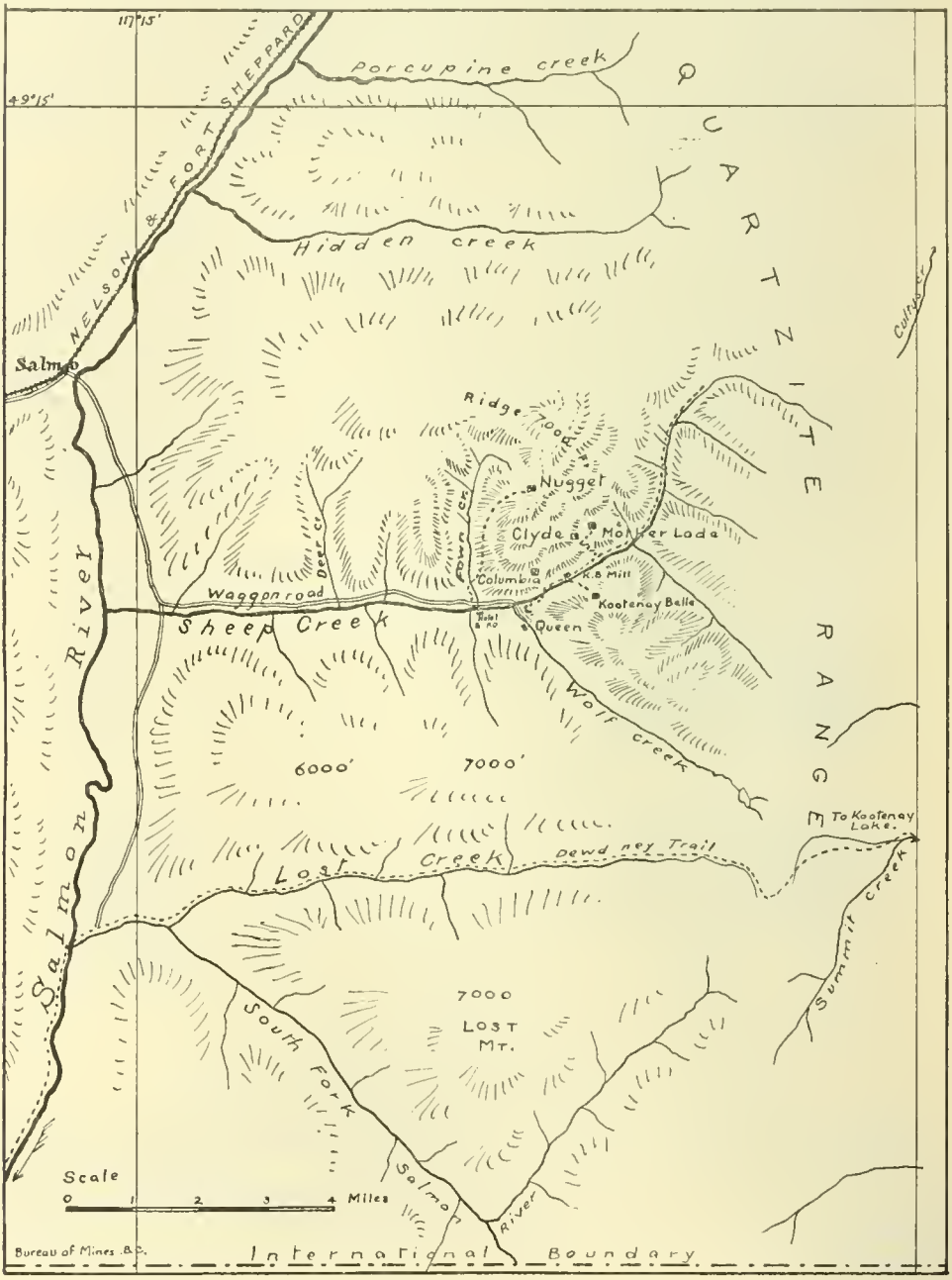
Mining receipts, general	$ 4,567 05
Free miner's certificates	4,692 75
Two per cent. mineral tax	7,432 45
Twenty-five cents per acre tax	5,116 05
Total	$21,808 30

SHEEP CREEK CAMP.

Notes by W. F. Robertson, Provincial Mineralogist.

Sheep creek is a stream flowing into the Salmon river from the eastward at Salmo, a town on the Nelson and Ft. Sheppard Railway in the Ymir District. The camp includes the whole area drained by the creek, but the present developments have been chiefly in the vicinity of the "Forks"—that is, the junction of Wolf creek with the main stream, about ten miles up from the Salmon river.

Although recent successful development has again attracted much attention, the camp is not a new discovery, having received much serious development for over ten years; in 1899 "the *Yellowstone* mine, at the junction of Sheep and Wolf creeks, employed from ten to thirty men below ground and from twenty-five to one hundred men above ground, but made no shipments." In 1900, at this mine, 931 feet of tunnel work was done and a 10-stamp mill completed, in which, in that year, 8,467 tons of ore were treated; the mine was worked until the late fall of 1901, when it was closed down, owing to the exhaustion of visible ore.



In 1900 the *Queen* group of four claims, adjoining the *Yellowstone*, also a free gold property, had 200 feet of development workings done on it, and in 1902 this property was worked under a bond by the Holmes Syndicate, which mined 4,402 tons of ore that were milled in the *Yellowstone* mill, producing gold by amalgamation of approximately $19,000 in value, in addition to which 216 tons of crude ore and concentrates of $7,500 in value were shipped. The Holmes Syndicate, however, allowed its bond to lapse, and the property was subsequently run in a smaller way by one of the owners, William Waldie, of Nelson, who, in 1903, leased the *Yellowstone* mill, which had been standing idle for a couple of years. He built a surface tramway, about a quarter of a mile long, connecting the *Queen* mine with the mill, and in 1904 managed to mine and mill nearly 5,000 tons of ore, despite the fact that the mine had been pretty well "gutted" of any visible ore by the previous leasers. It will thus be seen that the camp had a fair start as far back as 1899, but the failure of the *Yellowstone* and the temporary abandonment of the *Queen* gave it a very bad "set-back," and the camp owes its revival largely to the courage and energy of Mr. Waldie, who kept working away at the *Queen*, making it pay, thus unquestionably causing the further prospecting in the vicinity, which led to the more recent discoveries which have produced some exceedingly rich gold ore, and the camp has once more been brought into prominence.

The following is a record of at least the most important shipments of ore made from the camp, or treated on the ground :—

Mine.	Year.	Tons mined.	Gold, oz.	Silver, oz.	Value.	Total value for mine.
Yellowstone	1900	8,467	3,847	2,935	$ 80,953	
"	1901	8,520	2,065	1,419	43,378	
						$ 124,331
Queen	1902	4,519	2,445	924	$ 50,990	
"	1903	144	213	159	4,480	
"	1904	4,846	1,624	491	33,808	
"	1905	6,078	3,149	1,174	65,664	
"	1906	7,025	2,501	1,040	52,204	
"	1907	8,845	5,011	1,650	104,385	
"	1908	8,798	6,235	2,308	130,006	
"	1909	11,288	5,308	2,237	110,811	
						552,348
Kootenay Belle	1905	324	1,070	633	$ 22,426	
"	1906	739	1,157	1,055	24,431	
"	1907	895	612	179	12,738	
"	1908	1,476	1,130	327	23,517	
"	1909	1,672	817	13	16,903	
						100,015
Mother Lode	1906	72	385	137	$ 8,025	
"	1907	47	186	75	3,881	
"	1908	374	1,026	350	21,379	
"	1909	123	631	726	13,398	
						46,683
Nugget	1907	22	125	24	$ 2,595	
"	1908	1,209	1,742	684	36,342	
"	1909	5,492	5,927	938	122,970	
						161,907
Total camp to date		80,975	47,206	19,478		$ 985,284

Queen.

The *Queen* mine is the oldest operating property in the Sheep creek camp, and is situated on Wolf creek, a couple of hundred yards above its junction with Sheep creek. The property has been producing for ten years, has been extensively developed, and the values have been found to continue fairly uniform with the depth attained, so that this mine is accepted as a guarantee for the probable

permanence of the other properties in the camp, and its development is watched with more than usual interest. The mine development consists of three adit tunnels driven in on the strike of the vein, the lowest of which, the No. 3 level, is slightly above water-level in the creek, and has been driven in about 900 feet. The No. 2 tunnel, or level, has been driven in 450 feet from the outcrop, and these two tunnels are connected by raises and stopes, the ore being trammed out through the No. 3 level. Below the No. 3 level a couple of winzes were sunk to a depth of about 200 feet, and from these No. 4 level and No. 5 level have been run, each for a distance of some 600 feet, the northern end of both these levels being now about vertically below the portal of No. 3 level. The vein has a width of from 2 to 20 feet, in which the mineralisation, consisting of free gold and iron sulphides carrying gold, with a little galena, etc., is found chiefly in the vicinity of a dark igneous dyke, which cuts across the quartz. To judge by the stoping done, it would appear as if the pay-ore occurred in a couple of large chutes, or chimneys, having a length, on the No. 3 level, of from 100 to 125 feet, with a less width in the upper levels and greater in the lower levels. For the years 1907 and 1908 the ore milled yielded about $12 a ton in gold, but the general average in 1909 was a little below $10 a ton, due to an endeavour to increase the tonnage at the expense of the quality of the ore mined. Above the No. 3 tunnel the ore-chutes have now been pretty well stoped out; below this level there was still a considerable quantity of stoping ground blocked out, but the development was not being kept in pace with the extraction. The output of the mine for a number of years back is shown in the preceding table. The milling plant has been doubled and now consists of four batteries of five stamps each, followed by four Wilfley tables. The plant is operated by water-power under a head of 451 feet; the company has more than an ample supply of water, owning records on both Wolf and Sheep creeks; the water is brought from each creek by a flume and thence to the mill in 16-inch iron pipes, providing power for the mill, a 10 and a 5-drill air compressor, and a sawmill. The mill crushes about 60 tons of ore a day to a 50-mesh screen, about 60 % of the values being recovered by amalgamation; the remainder is obtained in concentrates consisting of iron pyrites, galena, and zinc blende, carrying about 2 oz. of gold to the ton. These concentrates are shipped by waggon to Salmo and thence to the smelter by railway.

The property is now owned by a company, the Queen Mines Inc., with head office in the United States, and in October last was under the management of Mr. Charles Lewiston, who employed about thirty men underground and fifteen above ground. Later in the year the management was taken over by Mr. E. V. Buckley, who is now in charge. This company has now acquired the old *Yellowstone* property and other claims and is doing some new development on the *Alexandria* mineral claim, where three men were at work in a tunnel that had been run in for 100 feet on a 2-foot quartz vein, from which samples had been obtained assaying as high as $40 in gold.

Kootenay Belle.

The *Kootenay Belle* group, comprising several claims, adjoins the *Yellowstone*, and is a little farther up on the left side of Sheep creek, above Wolf creek. This property is now held under bond by Messrs. Warner, Morrison & Black, and was not actively operated during 1909. The property has been under development for a number of years, and in 1904 was worked under a lease by George D. and John Bell, who expended considerable money in development and succeeded in uncovering ore in two veins. One vein was prospected by a shaft, in which ore to a width of 4 feet was found; in this there was a rich streak from 3 to 6 inches wide, assaying about $50 in gold, the remainder of the vein being concentrating ore. The second vein was opened up by an adit tunnel, exposing a quartz vein from 9 inches to 2 feet wide, carrying high gold values. The Bell lease was taken over by Patrick Clark, of Spokane, and he did a great deal of work on

the property, but did not complete the bond; subsequently very little work was done on the property until 1907, when it was bonded by Warren and associates. The property produced during the years 1907, 1908, and 1909 ore to the amount of 895 tons, 1,476 tons, and 1,672 tons respectively, of an approximate average value of $15 a ton.

Stamp-mill.—A stamp-mill, to treat the ore from the mine, has been built in the valley of Sheep creek and connected with the mine by a wire-rope tramway. Neither the mine nor the mill was in operation when the property was visited in October, 1909, as a reorganisation of the company was under way. The mill building is of a rather temporary character, and contains two 5-stamp batteries and two double-stamp batteries, with, for the saving of concentrates, a Wilfley table and a Frue vanner. The mill is run by water-power, the company having a water record and having constructed a flume from Sheep creek, delivering the water under a head of 40 feet, which was sufficient for the first installation of a pair of double stamps, but for the subsequent installation of 10 stamps, power had to be obtained from water taken from the *Queen* ditch and brought down by a 12-inch pipe, delivering the water under a head of 400 feet. There was a watchman at the mill, and three men were employed at the mine on development work.

Columbia.

The *Columbia* mineral claim, owned by John G. Devlin, is located on the hill about 1,000 feet directly above the *Kootenay Belle* mill, and across the valley from the mine. The property is under lease and bond to Mr. Warner and associates, who have built a wire-rope tramway down to the *Kootenay Belle* mill. This property was also closed down, pending the formation of a company.

Clyde-Belt Group.

The *Clyde-Belt* group consists of five claims, the *Clyde*, *Belt*, *Lilly D.*, *Hannah Fr.*, and *Kathie*, owned by John G. Devlin, Dr. Wilson *et. al.*, of Nelson. The property is on the north side of Sheep creek, about a mile above the junction of Wolf creek, adjoining the *Mother Lode*, and almost directly across the valley of Sheep creek from the *Kootenay Belle*. The workings are at an altitude of about 5,150 feet, or about 2,200 feet above the creek level. Although the property is only, as yet, in the process of development, a tunnel had been driven in for about 100 feet along a quartz vein, 24 inches wide, carrying free gold in payable quantity, with little visible sulphides of any sort. The claims have been surface-prospected by numerous open cuts, indicating two or more parallel quartz veins carrying gold, which give great encouragement that the property may develop into a mine. A log bunk-house and cabin have been erected just above the tunnel, while, at its mouth, a rough sorting-shed has been put up, in which a number of tons of ore was sacked and ready for rawhiding. A new trail with proper grades, etc., was under construction and promised to be ready for use before fall. Six men were being employed on development work.

Nugget.

The *Nugget* group, consisting of three claims, the *Nugget*, *Bonanza*, and *Cayote*, is situated at the head of Fawn creek, on the range of hills separating Fawn creek from the upper portion of Sheep creek. The group is reached from Salmo by the Yellowstone waggon-road, from which, at a point about eight miles out from Salmo, a crude and very steep road branches off to the mine, rising some 2,500 feet in a distance of about two miles. The property first attracted serious attention in 1907, when the then owner shipped 22 tons of ore from practically surface workings, which yielded over $114 a ton in gold.

The mine was then taken over by the Nugget Gold Mines, Ltd., a company formed by local capital, and during the years 1908 and 1909 the success met with, from what might even yet be called prospecting workings, has been wonderfully encouraging. The operations have

been made under the direction of Mr. A. H. Gracey, the president of the company, a mining engineer of Nelson, who, with commendable prudence, has endeavoured to prove that he had a mine before installing any expensive equipment, in which endeavour he would seem to have been successful.

In 1908, after some tons of ore had been rawhided down the mountain and its actual gold tenure assured from smelter returns, and an amount of mining development had been completed, sufficient to guarantee tonnage to at least pay expenses, a very temporary reduction plant was erected, some 1,500 feet below the mine, consisting of 4 stamps and two 6-foot Frue vanners, driven by steam-power, generated with wood as fuel. The mill was only looked upon as a temporary testing plant, and was installed at the lowest possible expense, as, from appearances, much of the machinery was not new, and the total cost of the mill and tramway was approximately only $12,000. The mill has been treating about 450 tons of ore a month, employing five men and consuming three cords of wood a day. In 1908 the mine produced 1,209 tons of ore, which yielded 1,742 oz. of gold and 684 oz. of silver, having a value of approximately $36,000.

In 1909 there was crushed in the mill 5,150 tons of ore, yielding bullion to the value of $77,396, in addition to which there was shipped as crude and concentrates 342 tons, containing 2,058 oz. gold and 938 oz. silver, having an approximate value of $43,884, making the gross output for the year $121,280. It will be seen, therefore, that the average yield of the ore to the ton was about $22.40.

The veins, of which there are at least two or three, parallel, run with the range of hills, dipping at a steep angle.

The No. 1 tunnel had, in October, been driven on the *Nugget* vein about 50 feet, starting from an outcrop.

No. 2 tunnel is 60 feet lower than No. 1, and is a crosscut through country rock for 70 feet, when the vein was cut and drifted upon for about 200 feet. No. 3 tunnel, 86 feet lower than No. 2, is a crosscut for 140 feet to the vein, which at this level had been drifted upon for 480 feet.

No. 4 tunnel, 155 feet lower than the No. 3, is a crosscut for 350 feet to the vein, which at this level had not then been opened out.

From No. 3 level a crosscut was driven to the north to cut a vein seen on the surface, parallel to the *Nugget* vein; this second vein, known as the *Calhoun* vein, was struck after 70 feet of crosscutting, and appears to be similar, in width and values, to the *Nugget* vein.

The *Nugget* vein, as developed by the workings, has an average width estimated at between 4 and 5 feet, and the ore chutes so far worked would appear to extend for a length of from 400 to 500 feet along the vein. The ore so far mined has been chiefly from development workings, although some stoping has been done on No. 3 level. It is probable that this coming season the company will install a more extensive mill and plant, and greatly increase the output of the mine.

Mother Lode.

The *Mother Lode* mine is situated on the north slope of Sheep creek, about two miles above Wolf creek, and directly over the summit of the mountain from the *Nugget* mine, at an altitude of about 5,800 feet. It is not a recent discovery, but was revived three years ago when it was bonded from original owners by Mr. Warner and associates, who did a great deal of prospecting work and then turned it over to Mr. John McMartin *et al.*, who are now developing it, the work being under the direction of John Mohun as superintendent, with Mr. Evans as assistant.

The workings carried on under previous ownership consisted of a lot of shallow excavations along the outcrops of several veins, most of which were found so caved-in when the

property was visited in October, 1909, that little could be learned from them, further than that there were several well-defined parallel veins, that these veins have every appearance of permanency, and that they are of workable width, carrying from 20 to 24 inches of quartz in the open workings. The veins have a general strike of about N. 55° E., and a dip to the south of from 75° to 85°. The present owners are making a serious attempt to test the veins at a greater depth, and have run in a crosscut tunnel, known as No. 2 tunnel, for 150 feet to the principal vein, along which drifts have been run to the left for 330 feet, and to the right for 240 feet. In this length of drift the quartz vein was continuous and well defined, although it was not claimed that it was all pay-ore, but that, in that length, three pay-chutes had been cut, on which a little stoping had been done and the ore taken therefrom entered into the shipments mentioned later. The quartz in the vein at this level contained little, if any, visible sulphides, and the gold was "free," the ore being very similar in appearance and value to that of the *Nugget* mine, just over the hill.

About 75 feet lower down the hill No. 3 tunnel has been driven as a crosscut for 340 feet, when the vein seen in No. 2 tunnel was struck at that increased depth, and drifts had been driven on the vein, to the left for 70 feet and to the right for 75 feet, but no stoping had been started. The vein here was continuous and similar to that in upper drifts, but contained a large quantity of sulphides—iron pyrites, zinc blende and galena—in some spots there being solid sulphides for a width of 18 inches. What significance this appearance of heavy sulphides may have remains to be proved. It is quite impossible to form any idea of the value of ore of this character by inspection, and its general value can only be inferred from shipments actually made, and these were as follows:—

In 1907—Shipped 47 tons, containing 186 oz. gold and 24 oz. silver in total shipment.

1908—Shipped 374 tons, containing 1,026 oz. gold and 350 oz. silver in total shipment.

1909—Shipped 123 tons, containing 631 oz. gold and 376 oz. silver in total shipment.

From this it appears that the average value of ore shipped was approximately $70 a ton.

In the No. 2 tunnel, two shifts of two men each were mining, and eight miners were employed in the No. 3 tunnel. Considerable construction work was under way, and it is understood that a mill will be erected during the coming year.

ARROW LAKE MINING DIVISION.

Report of Walter Scott, Mining Recorder.

I have the honour to submit my annual report on the Arrow Lake Mining Division for the year ending December 31st, 1909.

On the *Big Ledge*, situated on Bald mountain, Pingston creek, Upper Arrow lake, the several groups of claims have been bonded, but no shipments have been made.

On the *Monarch* claim there is a large outcrop of zinc ore.

On the *Empress* gulch, on the west side of the gulch, there is also a large exposure of zinc ore; the exposure from base to apex is 600 feet.

On *Emma* and *Delenger* gulches there are large showings of zinc ore where Nature has exposed the vein.

A force of men are driving a tunnel on the *Sunshine* to tap the vein at depth.

Office Statistics—Arrow Lake Mining Division.

Free miner's certificates issued	21
Certificates of work recorded	15
Mineral claims located	10
Bills of sale, etc., recorded	12

ROSSLAND DISTRICT.

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REPORT OF J. KIRKUP, GOLD COMMISSIONER.

I have the honour to submit my report of mining operations in the Trail Creek Mining Division during the year 1909.

During the past year the mining operations were carried on almost exclusively by the three companies operating on Red mountain, viz.: The Consolidated Mining and Smelting Company of Canada, Limited; the Le Roi Mining Company, Limited; and the Le Roi No. 2, Limited. In addition to the foregoing, five small properties were worked under lease during some portion of the year.

The shipments of ore were less than those of the previous year to the extent of 65,600 tons, the output being 237,656 tons, of an approximate value of $2,875,084, as compared with an output of 302,419 tons, valued at $3,673,392, for the previous year, the decreased tonnage being accounted for through the closing of the *Le Roi* mine during a period of five months and the small tonnage shipped since work was resumed.

The average number of men employed during the year was 736, which is a decrease of 90 compared with the previous year.

Centre Star Group.

The *Centre Star* group of mines, consisting of the *Centre Star*, *War Eagle*, *Idaho*, and *Iron Mask*, the property of the Consolidated Mining and Smelting Company of Canada, Limited, is situate on the east slope of Red mountain, and containing some eighty acres of land, carrying surface rights, has been continuously operated during the past year by the owners, the shipments during such time consisting of 180,409 tons, which is practically the same as during the previous year. During the past year, in addition to the mining which has been carried on in the older workings, a large tonnage of ore has been taken from a number of new ore-chutes which have been opened up in different parts of the property, more particularly that on the ninth level of the *War Eagle*, which is 400 feet long and of an average width exceeding 25 feet, which has yielded a large tonnage of high-grade ore. This ore-body has been opened up for a considerable distance below the ninth level, with equally good results, and no doubt a large amount of ore will be produced therefrom. Development work during the year on the group was as follows, viz.: Driving, 10,140 feet; raising, 1,489 feet; crosscutting, 4,344 feet; winzing, 300 feet; making a total of 16,273 feet, together with 21,048 feet of diamond-drilling. The average number of men employed during the year was 470, being an addition of 20 over the previous year.

Le Roi, Black Bear.

These mines, the property of the Le Roi Mining Company, Limited, are also situate on Red mountain, and were worked by the owners for a period of seven months during the year, having closed down in the month of March for the purpose of laying before the board of directors a plan of development and for the financing of such, resuming work in the month of August with a reduced force of men and with reduced shipments, the output for the year being 11,582 tons, as compared with 73,127 tons during the previous year. Development work during the year consisted of driving and crosscutting, 3,065 feet; raising, 130 feet, together with 12,102 feet of diamond-drilling. The average number of men employed during the time the mine was being operated was 129.

KOOTENAY BELLE MILL, SHEEP CREEK, NELSON M. D.

HALL CREEK, AINSWORTH MINING DIVISION. Looking up.

Le Roi No. 2.

The *Le Roi No. 2*, *Josie*, *Annie*, *Annie Fr.*, *Poorman*, and *No. 1* are adjoining properties situate on the west slope of Red mountain, owned and operated by the Le Roi No. 2, Limited. During the year they produced 29,571 tons of first-class ore and 15,984 tons of second-class ore, which was put through the company's mill and concentrated into 835 tons of concentrates. Development work during the year consisted of driving, 2,167 feet; crosscutting, 516 feet; sinking the main shaft an additional 500 feet; and winzing, 32 feet; together with 10,048 feet of diamond-drilling; the general development of the mine being quite satisfactory. The average number of men employed during the year was 125.

Inland Empire.

Development work has been carried on continuously during the year on this property by a small force of men. A compressor plant has been added to the very complete equipment, and, consequently, the management has been able to do a considerable amount of sinking in the main shaft through the addition of power-drills, and it is confidently expected that shipping of ore will be proceeded with within a short time.

The following properties were worked under lease during portions of the year, with shipments of ore as follows, viz.: *Velvet*, 180.77 tons; *Blue Bird*, 30.24 tons; *I. X. L.*, 21.82 tons; *Hattie Brown*, 15.72 tons; and *O. K.*, 11.83 tons (the *I. X. L.* being still worked under lease).

The returns from the output of ore for the year are quite favourable, the average value being a little in excess of $12 per ton, which is approximately 10 cents per ton less than that of the previous year.

In addition to the foregoing, very little work was done other than the assessment work on a small number of claims, as shown by the accompanying office statistics.

Office Statistics—Trail Creek Mining Division.

Mineral claims recorded	30
Certificates of work	36
Certificates of improvement	3
Bills of sale, etc., recorded	2
Free miner's certificates (company)	7
" " (individual)	168
" " (special)	2

BOUNDARY DISTRICT.

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GREENWOOD MINING DIVISION.

REPORT OF W. G. McMYNN, GOLD COMMISSIONER.

I have the honour to submit my annual report on mining operations in the Greenwood Mining Division during the year 1909.

Throughout the district there has been a revival of interest taken in mining properties, especially towards the end of the year, and the outlook for 1910 is most promising. In addition to the large holdings acquired by the Consolidated Mining & Smelting Company of Canada in Central camp, on which a preliminary force of about forty men is employed, there are two tunnel-prospecting companies at work, the Greenwood and the Phœnix Tramway Co., to the north of the town of Greenwood, having as its objective point the *Crescent* mineral claim, at a distance of about 5,000 feet, on which over 200 feet has been done, and the other to the south, the Argo Tunnel & Mining Co., having as its objective the *Starve Out* mineral claim, distance about 640 feet, on which about 300 feet of work has been accomplished. About three miles west of Midway, the Boundary Exploration & Mining Company has had a small force of men working for some months prospecting for coal, with fair indications of success, a total of 175 feet of shaft and drifts having been done.

British Columbia Copper Co., Ltd.

This company is working the *Mother Lode*, *Oro Denoro*, and *Wellington* groups of mines, in the Greenwood and Grand Forks Mining Divisions. It owns other mining properties in the vicinity, among them the *Napoleon* mine, near Boyds, Wash., U.S.A., and the *Lone Star* and *Washington* group, situated just across the International Boundary line from White's camp, and which has a large tonnage of copper-gold ore (300,000 to 350,000 tons) awaiting railway transportation facilities for its shipment to the company's smelter at Greenwood. Labour difficulties in the Crow's Nest District necessitated a suspension of work at both mines and smelter for three or four months, during the first half of the year; consequently, ore production was smaller. The material smelted in 1909 totalled about 359,000 tons; of this amount about 350,000 tons came from the *Mother Lode* mine. All the ore produced from this mine was taken from above the 400-foot level. Some exploration has been done at the 500-foot level, but there has not yet been any production from this greater depth. Between 900 and 1,000 feet of underground development work was done and about 4,000 feet of diamond-drilling. The mine gives regular employment to from 240 to 250 men. For about six or seven months of the year there was no mining done at the *Oro Denoro* mine; while at work, some 200 feet of development and 1,200 feet of diamond-drilling were done. This company, in its last published annual report, had the following statement: "In arriving at the operating costs for the year, the total expenditure has been taken from May 1st, thereby including all expense of opening up the properties after the shut-down, although production was not started until June 1st. Upon this basis the cost per ton of ore handled, including all charges from ore in place to sale of the contained metals, was $2.6322. The cost of producing, refining, and marketing per pound of fine copper, after crediting expenditure with the value of the gold and silver, was 9.996 cents." A more recent report stated the cost for that month of producing and marketing copper at 8.8 cents per pound.

The company's smelting and converting plant, being quite modern and only in use a comparatively short time, was not changed in 1909. Enlargement of two of the three 700-ton blast-furnaces is to be made next year in order to provide for the larger tonnage of ore to be available when railway connection with the company's mines in Wellington camp shall have been completed, also for ore from the New Dominion Copper Company's mines, which, it is stated, will be treated at this smelter.

Granby Consolidated M. S. & P. Company.

A summary of the year's work done by this company shows that the quantity of ore mined and shipped in 1909 was about 1,068,000 tons, gross, and that the mining-development work done consisted of 7,109 lineal feet of drifting and crosscutting, 3,866 feet of raising, and 120 feet of sinking, a total of 11,185 lineal feet, or a little more than two miles. Additions to machinery, buildings, etc., during the year included the following: An electrically driven pump was installed on the 400-foot level and another on the 300-foot level, a Gould's 7 by 10-inch S. A. triplex plunger pump; an electric haulage system was put in on the 300-foot level, and on No. 2 level electric locomotives were substituted for those driven by steam that had been used previously. On the surface a new machine-shop, 60 by 100 feet—a wood building—was erected, also a brick building, with concrete roof, for storing thawed powder. New plant installed was an electric powder-thawer and two drill-sharpeners, designed and made on the works. The buildings being rented for office purposes were purchased and made much more suitable for offices and comfortable for the staff, while, for the accommodation of the men, a new wash-house was fitted up with baths, shower-baths, lockers, and other conveniences.

The company, in its last annual report for the fiscal year ended 30th June, 1909, stated the costs, including all expenses, at $3.20 per ton of ore, which, after deducting the value of the gold and silver contents of the ore, made the cost of producing copper 10 cents per pound. The manager reported the metal extraction for the year to have averaged 21.81 pounds of copper, 0.2724 ounces of silver, and 0.0434 ounces of gold per ton of ore.

Note by Provincial Mineralogist.—Mr. O. B. Smith, manager of the company's mines, recently informed the writer that the cost of mining, including the crushing of the ore to furnace size and delivering same on board cars, was 84 cents a ton—a performance well worthy of special note.

Consolidated M. & S. Co. of Canada.

This company has acquired several new properties during the year. One of the most important of these is the *No. 7* mine, located in Central camp, about three miles south-east of Boundary Falls. This property has about half a mile of underground workings and has sufficient ore blocked out to justify the erection of a mill. It is the intention of the company to provide this in the spring, as well as an aerial tramway connecting the mine with the mill, which is to be located at Boundary Falls. The vein in this property is well defined and shows an average width of 2½ feet. The principal values are gold, silver, and lead, while the gangue is white quartz, carrying sulphides. Besides the *No. 7*, the company has purchased the *Cuber Fae Fraction* and *Black Jack* claims, and has under bond the *New York* and *Norfolk* claims. The company also located three claims during the year, under the names of the *No. 55*, *No. 66*, and *No. 77*.

Jewel Mining Syndicate.

This syndicate, whose properties are situated in Long Lake camp, has nearly completed the erection of a mill and cyanide plant; the mill consists of a Fraser & Chalmers 15-stamp mill, three Wilfley tables, and other machinery and plant. The installation includes, besides that above mentioned, a Blake crusher, a 7-drill air-compressor, and an electric hoist directly connected to a 50-horse-power motor. A Simplex drill, a self-rotating device, was obtained for use in the

mine. A gravity tramway was constructed from mine to mill, and equipment for conveying ore from crusher to mill feed-bin was also put in. All the mechanical engineering work was done by R. Roberts, manager of the mine, who also superintended construction and equipment of the mill. The *Jewel* is a gold-quartz property of much promise, and since careful tests were made at Denver, Col., of the ore, in order to determine the kind of plant best suited to mill it, successful and profitable results may be looked for after the plant shall have been placed in good running order.

OTHER PROPERTIES IN THE DISTRICT.

Some work was done on the *Crescent*, near Greenwood, and about 20 tons of ore shipped, but towards the end of the year its compressor and other power-plant was removed to the site of the Greenwood-Phœnix Tramway's tunnel, commenced last year, now being driven into the hill towards Phœnix.

On the *Bruce* claim, about three miles west of Midway, considerable surface work was done, including the building of a waggon-road about one mile in length, over which about 210 tons of ore were hauled to a siding on the Canadian Pacific Railway just below the mine.

The *Sally* mine, situated on Wallace mountain, up the West fork of Kettle river, and distant from the present terminus of the Canadian Pacific Railway at Midway about fifty miles, continued active development work during 1909. About 146 tons of high-grade ore were shipped, netting to the shippers an average of about $100 a ton, the value being chiefly in silver. Besides the first-class ore, about 900 tons of milling ore, containing silver, etc., of a value of about $25 a ton, were placed on the dump, increasing the quantity of ore of this value to about 3,000 tons, stored and awaiting the provision of concentrating facilities. The development work done on the property during the year consisted of about 1,000 feet of tunnelling and 150 feet of shaft-sinking. Some 200 feet of surface-stripping was also done.

OFFICE STATISTICS—GREENWOOD MINING DIVISION.

Free miner's certificates	335
Mineral claims recorded	122
Placer "	4
Certificates of work recorded	294
Conveyances, etc	98

GRAND FORKS MINING DIVISION.

REPORT OF S. R. ALMOND, GOLD COMMISSIONER.

I have the honour to submit the annual report of the progress of the mining industry for the year 1909 in the Grand Forks Mining Division.

As the Granby smelter is the most important feature of that industry, and as a report of the work done there alone is a good criterion of what is going on in this Mining Division, in mining as well as smelting, I submit the following report of the general manager of the smelter and mines of the Granby Company, Mr. A. B. W. Hodges, kindly given for the purpose for which it is now being used:—

"GRANBY SMELTER.

"In every way, more especially along constructional lines, 1909 has been the banner year for the Granby smelter. There has been no year, since the completion of the original plant, in which such extensive improvements have been made. Of the eight blast-furnaces, Nos. 2, 3, 4, 5, 6, 7, and 8 have been enlarged this year. This enlargement consisted, as in the case of

No. 1 the previous year, in deepening each furnace by 4 feet, and increasing the length by one jacket, or by 4½ feet. With these enlargements completed, the furnaces are 44 inches by 266½ inches at the tuyeres, and have a depth of charge of 13 feet. This necessitated a 4-foot lowering of the entire furnace floor, as well as an equal amount of grading to the slag-dump in front of the blast-furnace building for use as a yard. Two graded cuts were made in the slag-dump, leading from the yard to the outer dumps. This work occupied an average of six weeks to each furnace. Besides the increase in smelting area resulting from the lengthening of the furnaces, a better efficiency was obtained because of the greater depth and length. This shows up distinctly in the maximum and average capacities of the eight furnaces to-day and what they were before being enlarged. The eight old furnaces smelted, as an average, about 2,800 tons of ore per twenty-four hours, and, as a maximum, 3,500 tons in twenty-four hours. At present, on account of the snow, the ore is not coming in as it should, so that the eight furnaces are not running up to their capacity. A few weeks ago seven of the enlarged furnaces were averaging a little better than 4,000 tons per twenty-four hours, with a maximum of 4,350 tons. At the same rate, the eight furnaces will average 4,600 to 4,700 tons, with a maximum of about 5,000 tons. A maximum yearly capacity for the eight furnaces may now be called 1,500,000 tons.

"This year has also seen great changes in the converting department. In place of the three old 72 by 100-inch converters, there are now three new 84 by 126-inch converters, and one of the small ones. All of these new converters were first put into operation this year. As the capacity of the converters is now considerably greater than that of the furnaces, it is necessary to operate them only sixteen out of each twenty-four hours. It is estimated that the present capacity of the converters is 40,000,000 pounds of copper per year.

"A new blower building, 128 by 59 feet, was built during the summer months. This building is built entirely of steel and brick. With the completion of this building the smelter is well housed in every department, and, with the exception of the bins and samplers, is practically fire-proof.

"As the Granby smelter stands to-day, it is one of the largest smelting plants, using blast-furnaces alone, in the world. Tonnage of ore smelted in 1909, 1,050,000 tons (December estimated). Copper produced, 22,200,000 pounds (December estimated). Number of men employed on average, 365."

The Mines.

The bulk of the ore treated at the Granby smelter comes from the adjoining Mining Division of Greenwood, and, consequently, the progress in the development of most of the property of the company being worked at the present time comes under the purview of the Gold Commissioner for that Division.

The *Gold Drop*, owned by the Granby Company, has employed an average of ninety men during the year, and has extracted 146,788 tons of ore, and developed the mine by 1,850 feet of workings. No extra machinery has been installed in the last year.

The *Rawhide* and *Athelstan* claims, formerly worked by the Dominion Copper Company, have not been shipping ore for some time past. Some diamond-drilling is being done. These mines were heavy shippers up to a year or so ago, and it is to be hoped that in the near future they will again be on the shipping list.

The *War Eagle* (Boundary), worked by the Consolidated Mining & Smelting Company of Canada, has been fairly busy during 1909, put in some 2,300 feet of incline tram, spent over $3,000 on ore-bins, and has done 510 feet of development work. A new spur from the railway has been put in by the Canadian Pacific Railway Company, a distance of 1,810 feet.

The *Snowshoe*, also worked by the above company, has had 410 feet of development work done, has shipped 161,000 tons of ore, and has, on an average, employed 100 men. Most of the ore from this mine is treated at the Trail smelter.

On the *Jackpot* group, including the *Molly Pritchard*, *Prince Fraction*, *Athelstan Fraction*, *Coronet*, *Windfall*, and *Florence*, over $5,000 of outside improvements, in the way of boarding-houses, etc., has been done. A great deal of development work was also done, some 2,640 feet having been placed to the credit of the past year's work, with an average employment of thirty-five men. A waggon-road, over three-quarters of a mile long, was also built by the company, and the Canadian Pacific Railway Company built three and one-fifth miles of a spur, from the water-tank at Hartford Junction to this camp.

The *Oro Denoro* was worked under the management of the B. C. Copper Company and employed fifteen men, on an average, during the year just past. Under this force over 12,000 tons of ore were extracted from the mine and shipped to the smelter; a 70-foot crosscut and a winze of 85 feet were also made; considerable glory-hole work was done and some prospecting work.

The *Golden Eagle*, under the management of the Golden Eagle Mining and Development Company, has been under development during the year, but of the nature and amount of such work I am unable to speak, as the managing director, Mr. J. A Thompson, said that he was supplying the Department with the information asked for, having been asked by the Department at Victoria to do so.

The *Fife* mines, consisting of the *Dykehead*, *Three Bells*, *Ben Hur*, and *Fife*, are worked by the Fife Mines, Limited, and has kept an average of fifteen men employed during the year. With this force the company has made a most creditable showing, having run 800 feet of a tunnel, 100 feet of crosscutting, a winze of 45 feet from the tunnel, and a shaft 80 feet deep. At the present time an 8-drill Rand compressor and two 50 horse-power boilers are being installed. If report can be relied on, this company has under its control some very promising property.

Prospecting.

In the Grand Forks Mining Division, during the year, nothing in the nature of prospecting in new territory has been done, as most of the locations put on record have been merely relocations of claims that had become delinquent.

Assessment Work.

In this branch of the early stage of mine development much work was done, 318 records having been made in the past twelve months. This is not at all a bad showing when one takes into consideration that prospectors will only keep alive what they consider to be worth spending time and money on, as the transition from a prospect to a developing mine is slow nowadays and sometimes takes many years of patient work, entailing much expense, and very often much inconvenience and trouble.

Office Statistics—Grand Forks Mining Division.

Locations	131
Certificates of work	318
Transfers	48
Agreements	2
Filings	42
Abandonments	1
Certificates of improvement	23
Crown grants	9
Permission to relocate	2
Free miner's certificates issued	223

OSOYOOS MINING DIVISION.

Report of Jas. R. Brown, Gold Commissioner, Fairview, B. C.

I have the honour to submit herewith my annual report of the mining operations in the Osoyoos Mining Division for the year 1909.

This year almost no work, other than the necessary assessment work, has been done in Camp Fairview, and the same applies to the country south of it on Kruger mountain; near Okanagan falls some very good prospects have been located, but no work of any consequence done. I give below the accounts of work done at Camp Hedley and in the Keremeos valley.

Camp Hedley.

The following notes on Camp Hedley have been kindly contributed by Mr. A. McGraw, of Hedley, B. C.:—

In a great measure the story of the camp for 1909 is like that of other years, the story of progress and of achievement of the *Nickel Plate* mine, although the development on other properties, notably the *Kingston* group, has shown the widespread distribution of pay values in the camp.

Nickel Plate.

The story of the *Nickel Plate* for the past four years has been merely one of extraction, and could be summed up in the number of tons mined and milled during the year and the values obtained therefrom. This in itself is the greatest commendation which could very well be given a property, for the mines are few indeed that can stand four years' extraction without any expenditure for development, and yet that is absolutely true of the properties of the *Nickel Plate* group. During the year there was a shut-down of four months, which lessened the extraction from 42,100 tons in 1908 to about 31,100 in 1909. The only thing in the nature of development work during the past four years was exploratory work by diamond-drilling, of which this year 4,000 feet was done by the present owners, the Exploration Syndicate of New York, which had a bond to purchase, and spent four months (from the middle of April to the middle of August) diamond-drilling, sampling, and surface prospecting, which work resulted in the purchase of the property in the middle of August. Out of that syndicate was formed the present companies, which are known as the Hedley Gold Mining Co. and the new Daly Reduction Co., in which M. K. Rodgers and the Marcus Daly Estate, of the old company, are also shareholders.

Between what development was done since the new company took hold and the ground broken into in the course of extraction, there has been opened up during the year new ground as follows: On *Sunnysides No. 2*, 200 feet; *Sunnysides No. 3*, 300 feet; *Sunnysides No. 4*, 450 feet; *Nickel Plate*, 300 feet. The surface prospecting done by the Exploration Syndicate, in the course of their examination, was most important, both for the amount of work done and the results obtained, in showing up the wide distribution of pay values.

The importance to the camp in the change of ownership will lie chiefly in the vigour with which development will be pushed in the future, and the increased profits which must result from improved methods in the reduction of the ores. Heretofore the losses in the tailings from the milling operations have been very heavy, never less than $2.50 per ton, and they have been known to exceed $5 for considerable periods at a stretch. The plan by which it is proposed to stop this loss is the introduction of regrinding machinery to regrind the sands. The regrinding of *Nickel Plate* ores results in much sliming, which is always a bugbear in cyaniding, and this will be overcome by the introduction of filter-presses. The operations of the past four months in the mill have been closely watched, and a series of experiments conducted therewith to determine fully what will be required in the way of new equipment.

The power question is also one which will be dealt with decisively, and the occasional shut-downs in seasons of low water, which have hindered operations in the past, will be done away with. Heretofore the water of Twenty-mile creek was depended on to produce the power for all purposes, but shortness of water in unusually dry seasons and a rather indifferent installation had rendered it ineffective. Three alternative schemes are available, and during the coming year something definite will be determined upon. A few difficulties with the gravity tramway are being overcome by the present manager, Mr. G. P. Jones, who was formerly mine superintendent.

Kingston Group.

Next to the *Nickel Plate*, the operations on the *Kingston* group were the most extensive and were productive of the greatest amount of improvement in value. The beginning of the year found work in progress under the superintendence of H. C. Pollock, and this has been carried on throughout the year without interruption, the working force varying at different times from eight to sixteen. The amount of work done has been about 1,000 feet, but, more important still, it has resulted in showing up large bodies of ore, much of which is of excellent grade. The most important work done on the group was that on the *Metropolitan* claim, which had formerly received no attention other than a little surface prospecting by the former superintendent, F. M. Wells, who had located a couple of places where good values were obtained, but for reasons which he explained satisfactorily he did not follow up at the time, giving his sole attention to showings on other claims of the *Kingston* group and on the *Kingston* itself. Mr. Pollock, at the beginning of the year, started to sink on one of the showings found by his predecessor. The rock on the *Kingston* is very hard, and progress with hand-steel is necessarily slow; nevertheless, the mine force appears to have been very successful in getting so much done.

Golden Zone.

The *Golden Zone* is a property upon which considerable work has also been done during the year. The mineral deposit on it which has been under development, unlike the *Nickel Plate* and *Kingston* properties, is a fissure vein, the mineral contained is arsenopyrite, and the values are almost entirely in gold. The work during the year was the extension of a 35-foot shaft to a depth of 110 feet, the cutting of a station, and about 25 feet of drifting on the vein. The property is equipped with a steam-hoist, sinking-pump, and a 5-stamp mill, but no milling was done during the present year.

The *Pollock* group, upon which much valuable work was done in 1908, was not worked during the past year. Now, however, that the railway has been constructed to the foot of the hill upon which the property is situated, it is likely to receive more attention in the near future.

The *Florence* group and the *Oregon* were both given more work during the year than the customary assessment.

Keremeos Valley.

The following notes on the Keremeos Valley District have been kindly contributed by R. W. Northey, of Olalla, B. C.:—

The number of mineral claims receiving attention in the matter of development during 1909 was less than in any previous year, since this section of the Similkameen came into prominence as a mining district ten years ago. In the summit camps work was chiefly confined to Riordan, Independence, and Red mountains. Most of the work on Riordan mountain was done on the *Billy Goat*, chiefly the extension and deepening of open cuts on the summit and on the eastern slope. These showed up a much better grade of ore than had hitherto been obtained, and also proved the ore deposit to be of immense proportions. The ore carries gold and copper, with from 4 to 10 ounces of silver.

GRANBY MINES, PHOENIX. Shaft-house and Ore-bins.

GRANBY MINES, PHOENIX. A "glory-hole."

On the *Resort*, an adjoining claim, there is a large parallel ledge of the same class of ore, which runs north and south about 1,000 feet west of the *Billy Goat* workings, and which has been opened on for several hundred feet. On this ledge of fairly good grade ore the owner, James Riordan, did the assessment work for his two other claims adjoining, the *Afterthought* and *Resort No. 1*.

On the *Homestake*, owned by Northey and Hayes, of Olalla, and adjoining the *Billy Goat* on the south, the tunnel was continued 20 feet farther through ore, about 50 tons of which are now stored on a cribwork dump built upon the hillside. The ore is the same as that of the *Billy Goat*, both in appearance and value. A new find was also made on this claim about 500 feet south of the tunnel, but as the discovery was made late in the season not very much work was done on it. On Red mountain the work done was chiefly assessments; one new find was made, which went $10.50 in gold from surface samples.

On Independence mountain a new ledge was unearthed on the *King Arthur* within 200 feet of the *Apex* western line and coming straight from the *Apex* shaft. The capping of granular lime was completely covered with soil and it was merely an accident that brought it to the notice of the owners, Northey and Hayes. They crosscut this capping for 25 feet at a depth of 15 feet till they reached a quartzite wall. The ore was not deemed good enough for assay at that depth, being mostly iron pyrites and pyrrhotite. There is also a lead of white arsenical iron farther up the ridge on this claim.

The *Rocky Ryan*, which adjoins the *King Arthur* on the south, received during the summer some attention at the hands of its owners, Mathison, McNulty, and Roderick, of Phœnix, and showed up well; some of the ore, a white arsenical iron very similar to the *Nickel Plate* ore, assayed very high in gold.

The *Monarch's Daughter*, owned by W. Schoonover, of Fairview, and adjoining the *King Arthur* and *Rocky Ryan*, was further developed by open cuts and stripping.

Work was started by the new company on the *Apex* early in the summer and three new buildings were erected—manager's office, assay office, and cook-house. The mining done was in connection with the *Apex* shaft, where an adit tunnel was commenced about 100 feet down the hill, on the south side of the ridge, to intersect the drift at the 100-foot level in the shaft. About 50 feet of this tunnel was driven from the outside and about 10 feet from the drift outward, but the rock was exceedingly hard and progress was slow by hand-drilling. It was stated that the company would introduce machines next summer. At present no properties at the summit are worked during the winter. The Government waggon-road to the *Apex* camp was completed early in the fall, is well constructed, about three miles in length, and connects with the Nickel Plate-Penticton waggon-road at Centromino, nine miles east of the *Nickel Plate* mine, giving access to a great number of mineral claims on the east and north slopes of Independence mountain.

The *Horseshoe* group, situated on the spur of Independence mountain next south of the *Apex* ridge, and owned by McDonald and Mathison, was worked for a few months early in the summer by C. H. Cornell, who represented a small syndicate of Spokane mining men. Some white arsenical iron was met with at the start and a drift tunnel was run in about 18 feet, from which a crosscut was run 10 feet to the contact. In this latter considerable pyrrhotite was cut through, but the values were not sufficiently high and Mr. Cornell received orders to stop work. More work will have to be done on this property before its real value can be ascertained.

Late in the fall the *Dominion* group, situated on the south-western slope of Independence mountain, and owned by Alex. Ford, was examined by an expert from Vancouver, who took

out a large sack of samples for assay. The ore is similar to that of the *Billy Goat* and *Homestake* on Riordan mountain, and may possibly be the same ledge, as it runs in a direct line south from the latter and about two miles distant. Several other claims in the Upper Keremeos valley merely had the annual assessment work done on them.

In Lower Keremeos valley, also, there was very little development work done during the year. On the *Mount Zion* a new ledge was uncovered and about $200 worth of work done on it. It is 6 feet wide, strike N.E. and S.W., no perceptible dip, and lying between lime and quartzite. The ore looks rich, but two assays from a 6-foot depth gave $8.50 and $9.34 in copper, $3 in silver, and a trace of gold. The capping is chiefly spar.

On the *Copper King*, at Olalla, a considerable amount of development work was done, both in the early spring and late fall; an old open cut just below the shaft was commenced. Almost from the first shot the garnetite was splashed with yellow copper, which became more and more in evidence with every foot advanced. There is a very large body of good grade copper ore practically "in sight" on this claim, and the nearness to transportation by rail should enable it to be worked at a profit.

On the *St. Kevern* a small vein of high-grade copper ore was explored and followed into the hill for 12 feet by an open cut; further work must be by tunnelling. This appears to be a stringer which might lead to a body of ore.

OFFICE STATISTICS—OSOYOOS MINING DIVISION.

Certificates of work issued	185
Location records	109
Free miner's certificates issued	200
Certificates of improvements issued	5
Conveyances, etc	16

YALE DISTRICT.

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KAMLOOPS MINING DIVISION.

Report of E. T. W. Pearse, Gold Commissioner.

The Kamloops Mining Division is still in the undeveloped state in which it was last year, owing principally to lack of smelting facilities, as the ores, being low grade, will not stand the cost of shipment. Work has been kept up on all claims of any promise, and in every instance the property has increased in value, as will be seen by copies of reports on the *Python*, *Kimberley*, *Copper King*, *Bonanza*, *Laura*, *Wheal Tamar*, *Hill Top*, all situated in what may be termed the Kamloops camp.

The *Iron Mask* mine, which is also in the Kamloops camp, was under negotiations for sale this summer, but the transfer has not yet been recorded. This property has been comparatively idle this year, only a few men being employed on necessary work. The manager, for reasons best known to himself, did not respond to a request for a report.

Favourable reports are included of the *Copper King*, *Copper Queen*, *Chalcocite*, the *Cotton Belt* group, *Mountain Chief*, *Steeple Jack*, and other properties at the head of Seymour arm. These properties are almost entirely galena propositions. Special mention is made of a very fine strike on the *Mountain Chief*. Properties at Salmon arm have also given satisfactory results for development work done on them.

Reports of the cinnabar properties at Copper creek are very encouraging.

The Mamette lake copper properties are attracting attention, and one of them has been bought by a strong financial concern.

At Mara lake development work has been kept up, and assessment work has been recorded on all claims held. The work has satisfied the owners as to the value of their property, but nothing of special interest has been reported to me.

Kamloops Camp.

The *Python* owners have been quietly working in the tunnel, which is now in over 500 feet, the last 30 feet in ore, which they are not through, and have tapped the vein at a depth of 200 feet below the western open cut. They intend, through this year, to push work, drifting both east and west and blocking out ore.

The following is a short summary and description of the work recently done on the *Kimberley*, *Copper King*, *Bonanza*, and *Laura* groups of mineral claims :—

Kimberley. South zone—One glory-hole, 86 feet long, 50 feet wide, 22 feet deep ; one cut, 75 feet long, 5 feet wide, 6 feet deep ; six shafts, 6 feet long, 4 feet wide, 18 feet deep ; one cut, 100 feet long, 3 feet wide, 4 feet deep ; one cut, 135 feet long, 3 feet wide, 4 feet deep ; one cut, 50 feet long, 3 feet wide, 4 feet deep ; one glory-hole, 50 feet long, 30 feet wide, 16 feet deep ; one glory-hole, 50 feet long, 30 feet wide, 18 feet deep ; one cut, 75 feet long, 4 feet wide, 6 feet deep ; one cut, 230 feet long, 10 feet wide, 20 feet deep ; one cut, 384 feet long, 10 feet wide, 4 feet deep ; one cut, 350 feet long, 10 feet wide, 5 feet deep. North zone—One cut, 400 feet long, 10 feet wide, 7 feet deep ; 5 shafts, 6 feet long, 4 feet wide, 15 feet deep.

This work has fully demonstrated the existence of two zones of low-grade ore. Every cut, shaft, and glory-hole shows copper pyrites associated with iron pyrites and magnetite.

The South zone is traced for 3,260 feet, and is 900 feet in width; the strike is north-west, and the dip about 70° south-west. In this zone are large lenses of ore, varying from 100 to 384 feet in width. The work was done so as to crosscut to and trace the boundaries.

The North zone has been traced about the same distance and is 600 feet in width. The croppings, near the surface, consist of copper carbonates and heavy iron oxides. The matrix is dioritic, quickly changing to a felsite with depth and when copper appears, in sulphide form.

Copper King.

On the *Copper King* the following work has been done crosscutting the zone: One cut, 75 by 7 by 6 feet; one cut, 75 by 2 by 3 feet; one cut, 20 by 6 by 2 feet; one cut, 10 by 4 by 5 feet; one cut, 20 by 6 by 6 feet; one cut, 30 by 3 by 2 feet; one cut, 20 by 6 by 3 feet. The following work is along the strike: One glory-hole, 25 by 16 by 18 feet; one cut, 25 by 3 by 3 feet. This work shows an ore zone 1,200 feet long by 500 feet wide. Some exploration work was also done in the stope and the high-grade chute of bornite lost by the former owners was found and reopened.

On the *Bonanza* the work done consists of: One cut, 35 by 10 by 6 feet; one cut, 50 by 10 by 8 feet; one cut, 70 by 6 by 4 feet; one shaft, 8 by 5 by 15 feet; one shaft, 10 by 6 by 20 feet, and numerous prospect holes. There are possibly seven lenses of copper-ore on this property. The work is incomplete and so far as done only defines three lenses.

On the *Laura* the following work has been done: One cut, 70 by 6 by 4 feet; one glory-hole, 12 by 8 by 12 feet; one cut, 100 by 10 by 10 feet. The last cut (100 by 10 by 10 feet) is not quite finished, but so far has proved the existence of an ore-body 100 feet in width. The work of completion is in progress at the present writing. The matrix is a chloritic schist impregnated with sulphide of iron, hematite, and some magnetite.

Wheal Tamar.

The *Wheal Tamar* is being worked steadily by two men employed in driving the tunnel, which is now in 470 feet. One hundred more feet will be required to join on to the shaft on the main ore-body. The ore-body on this claim is described in the Canadian Geological Report for 1907-8, page 173, as being "a brecciated zone or area, mineralised with chalcopyrite. The ore is siliceous and the property carries 2½ per cent. copper and $1.50 silver and gold per ton." The main body is several hundred feet wide, and another ore-body, over 80 feet wide, was passed through in the tunnel. Over 700 feet of shafts and drifts have been made on this claim, almost all being good smelting ore.

The old mill at the *Star* mine at Stump lake, was moved to a point on the North Thompson near the *Hill Top* mine, the intention being to make mill-runs on ore from the *Gordon* gold-mine at Harper's camp, the *Noonday* gold-mine, four miles south of town, and from the *Hill Top*. From all these claims shipments of ore were made, which proved to contain values which would pay to mill locally. The gold ores on Jamieson creek are also conveniently situated for sampling at this point.

Seymour Arm Camp.

On the *Copper King* there are two more open cuts of about 40 feet each, one about 300 feet from No. 2 post, and the other cut 300 feet towards No. 1, which now expose the vein the whole length of the *Copper King* claim.

On the *Copper Queen* a large open cut was made to No. 1 post, but owing to the contour of the ground and the depth of drift has not exposed the extent of the ore-body.

On the *Chalcocite* another large open cut was made at No. 2 post, and exposed a body of 5 % copper ore, but not enough work has yet been done to prove the extent of the ore-body.

Supplies having to be packed in by men over a very rough trail, only the necessary work was done on the *Copper Queen* and *Chalcocite*. In the meantime, the main work is being done on the *Copper King*.

I might say that the ore is chalcopyrite, chalcocite (black oxide of copper), bornite, and a little native copper, with gold 50 cents to $1 per ton.

Cotton Belt Mines.

There has been little done except assessment work during the last year. It is next to impossible to do any amount of work there on account of not being able to get pack-horses over the Seymour river, but I trust that the difficulty will be overcome this year.

The only new thing of importance is a "strike" on the *Mountain Chief*, owned by Mr. A. Irwin, of Kamloops, a body of 4 feet 6 inches, apparently of good-grade ore.

The necessity of a bridge over the Seymour river and the completion of the trail to this property is strongly urged.

On the *Steeple Jack* the vein was stripped for 105 feet, exposing from 4 feet 4 inches to 6 feet wide, and a tunnel was driven 8 feet farther. The ore exposed at present on the vein is 25 feet, ranging in width from 2 feet 6 inches to 14 feet, carrying galena, copper pyrites, and zinc blende.

Salmon Arm Camp.

At Salmon arm, on the *Camp McLeod* group, the vein was crosscut for 28 feet, showing a quartz vein 24 feet wide. A tunnel was driven along the foot-wall for 50 feet, with an 8-foot crosscut in quartz.

Copper Creek Camp.

Very little progress has been made on the copper and cinnabar properties for the past year.

The Hardie Cinnabar Mining Co. drove 106 feet of tunnel and crosscuts, the work proving very satisfactory. About 100 feet of this work is in ore, assaying $\frac{3}{4}$ % mercury, and 4 feet is in richer ore. It is to be hoped that the company will erect a furnace during the coming season. The company's claims are all Crown-granted.

Alex. Hardie did the assessment work on two very promising cinnabar claims. The *Hardie Mountain* is showing up well.

Nothing has been done on the Tenderfoot Company's copper property for some time past. It is hardly likely that anything will be done before this claim passes into other hands.

G. Monkton is running a crosscut on the *Progresso* copper claim. The ore-bodies are improving with development work, which will be continued.

Mamette Lake Camp.

Nothing beyond assessment work has been done on the Mamette lake copper claims. The *Star* mineral claim is about to pass out of the present owner's hands to the B. C.-American Mining and Development Co., of Vancouver. This company intends to commence work at an early date, and considerable development work will be done on the Mamette lake properties this coming season.

Kamloops Office Statistics—Kamloops Mining Division.

Free miner's certificates	243
Certificates of work	133
Records (mineral)	127
" (placer)	1
Bills of sale	33
Certificates of improvements	8

ASHCROFT MINING DIVISION.

REPORT OF H. P. CHRISTIE, MINING RECORDER.

I beg to report to you that the mining situation in the Ashcroft Mining Division remains practically unchanged since 1909. Assessment work has been done and recorded on nearly all the claims alreads located, and the owners do not appear willing to relinquish their present holdings, but no development work of any magnitude has been done or any ore shipped.

NICOLA MINING DIVISION.

REPORT OF W. N. ROLFFE, MINING RECORDER.

Owing to remissness on the part of the manager of the Diamond Vale Collieries, situate in Nicola valley, to whom application was made for information, I regret my inability to furnish any details of what progress has been made by this company during the past year. The conditions of metalliferous mining in the district during the year have remained practically unchanged, but the proposed advent of railway activity through the valley has created a more hopeful feeling amongst those engaged in the industry.

At the Middlesboro' Colliery (the property of the Nicola Valley Coal & Coke Company, Limited, controlling 2,661 acres of coal lands) the work during the year has been energetically proceeded with, under the supervision of Mr. James Gray, the mine superintendent. The mine is operated by a main tunnel, No. 1, now driven 1,460 feet from the surface, the coal-seam in this tunnel being 18 feet thick, of which 15 feet is of excellent quality for domestic purposes. Ten tons of this coal was shipped to England for a coking test, and the very best results were obtained, proving it to be equal to the best English or Welsh coals in this respect. The method employed in working is the "room and pillar" system. The daily output is about 200 tons, and this will probably be increased in the near future, when added facilities for mining the coal, now in progress, have been installed.

The No. 2 tunnel is situate about half a mile south of the No. 1, but it is in a higher-pitched coal-seam. This tunnel has been driven in 1,640 feet from the portal, and a shaft has also been sunk 1,150 feet from the entrance of the main tunnel, which acts as a return airway or escape. The seam in the No. 2 tunnel is about 6 feet thick, the quality of the coal being good, with the exception of a band of rock some 4 inches thick.

At No. 4 mine, with five men employed, the coal is some 14 feet thick, about 5 feet of which is left on top for a roof, but which will be taken out later on.

The mine at No. 5 is being opened by a main tunnel, which has been run 1,040 feet from the entrance, the seam of coal encountered being 6 feet thick and of good quality.

Nearly 70,000 tons of coal were shipped during the year, and but for the labour troubles in April and May, the shipments would no doubt have been more.

In addition to the foregoing, a valuable coal-area of some 700 acres, adjoining the Nicola Valley Coal & Coke Co.'s property to the north, and the Diamond Vale Collieries, Limited, to the west, is now being prospected by a Minneapolis syndicate, with Mr. W. E. Duncan, M. E., as resident consulting engineer. Development work is, however, only in its initial stages. In the No. 1 shaft a seam of coal was struck at a depth of 35 feet, which proved to be over 22 feet in thickness, the largest one so far exposed in the Nicola valley. An analysis of the coal proved the quality to be exceptionally good.

OFFICE STATISTICS—NICOLA MINING DIVISION.

Claims recorded	45
Certificates of work issued	103
Free miner's certificates issued	118
Bills of sale recorded	11

YALE MINING DIVISION.

REPORT OF WM. DODD, MINING RECORDER.

Mining at Yale has been practically at a standstill since my report of 1908. Such prospecting as has been carried on is chiefly in the vicinity of Skagit and Coquihalla rivers, near Hope, on which the owners have done sufficient work to hold their claims.

OFFICE STATISTICS—YALE MINING DIVISION.

Free miner's certificates issued	35
" " (company's)	1
Mineral and placer claims recorded	23
Placer leases recorded	1
Conveyances recorded	2
Powers of attorney	1
Cash paid in lieu of assessment work	1
Notices and affidavits filed	16

SIMILKAMEEN MINING DIVISION.

REPORT OF HUGH HUNTER, MINING RECORDER.

I have the honour to forward the annual mining report on the Similkameen Mining Division for the year 1909.

There has been little development work done during the past year, except on the *Reco* mineral claim, situated on Copper mountain, the tunnel of which is being slowly extended.

Assessment work has been done on the majority of claims not already Crown-granted.

Railway communication has now been established, and this should encourage the opening-up of the mineral resources of this section.

OFFICE STATISTICS—SIMILKAMEEN MINING DIVISION.

Free miner's certificates issued	130
Location records	119
Certificates of work	296
Conveyances	36
Certificates of improvements	12

LILLOOET DISTRICT.

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LILLOOET MINING DIVISION.

REPORT OF C. PHAIR, GOLD COMMISSIONER.

I have the honour to submit my annual report on the progress of mining in Lillooet Mining Division during the year 1909.

PLACER-MINING.

Mr. H. M. Babb *et al.* worked during the season on their hydraulic leases on Alexander creek with a force of ten men. They did not take out as much gold as was expected, on account of not reaching bedrock—on which the pay-streak lies—which dipped below the grade of the flume.

Messrs. Leander and Chendahl, of Spokane, expended $2,500 in developing the Jesperson leases on Cayoosh creek with five men. A dam was built 150 feet in length and 8 feet in height; 550 feet of ditching were completed, and six test-pits, 10 to 18 feet deep, were sunk, showing satisfactory values in coarse gold.

Individual miners working six claims on Bridge river and Cayoosh creek made about wages.

The dredge on Fraser river ceased operation in June, and was dismantled.

Colonel Thomas L. Eggleston, of Washington, D. C., purchased seven hydraulic and creek leases at Bridge river and Cadwallader creek, and it is probable that he will purchase several more in that vicinity. As soon as the season opens he intends, if his mining engineer's report of the properties be favourable, to develop them on a large scale. He can obtain an abundance of water, and will have no trouble with tailings, which will be dumped into Cadwallader creek and the South fork of Bridge river. In consequence of Colonel Eggleston acquiring these properties, several applications for hydraulic leases in the vicinity of Bridge river have been made.

MINERAL CLAIMS—CADWALLADER CREEK.

Mr. A. F. Noel leased the *Ben d'Or* mines and carried on work with six men for five months and a half. He had to do a great deal of preliminary work—such as clearing out tunnels, repairing tram-line, flume, and mill—before operating the 10-stamp mill which is on the property. He extended the tunnel 65 feet and milled 240 tons of ore, which yielded $2,998. These mines were not worked previously for several years.

The *Lorne* mines were worked by four men, who crushed 190 tons of ore with a home-made arrastra, yielding $2,700.

The *Pioneer* claim was worked by Mr. F. H. Kinder, who crushed 20 tons of ore with an arrastra, which yielded $385.

On the *Wayside*, Bridge river, Messrs. Fergusson and Walker extended the tunnel 100 feet, and the usual good values continue. The ore is free-milling, and development work is now sufficient to justify the instalment of machinery, but the owners are waiting the building of a waggon-road—which they believe will shortly be constructed—to this property before incurring the great expense of taking machinery in over a trail.

BRECHIN COLLIERY OF WESTERN FUEL CO., NEAR NANAIMO.

They also constructed a ditch a mile in length by 5 feet in width, to convey water from Sucker creek to the *Marconi* and *Wireless* mineral claims, which are also their property.

The Anderson lake mines, at McGillivray creek, were worked by six men, and 275 tons of ore were milled on the premises.

OFFICE STATISTICS—LILLOOET MINING DIVISION.

Mineral claims recorded	71
Placer " "	6
Certificates of work recorded	46
Cash paid in lieu of work	6
Conveyances recorded	58
Mining leases in force	33
Dredging leases in force	6
Free miner's certificates issued	108

Revenue.

Free miner's certificates	$ 650 75
Mining receipts, general	2,515 75
Tax, Crown-granted mineral claims	379 00
Mineral tax	144 90
Total	$3,690 40

CLINTON MINING DIVISION.

REPORT OF F. SOUES, GOLD COMMISSIONER.

I enclose herewith statistics for the Clinton Mining Division of Lillooet District, and regret that I cannot report any improvement in mining during the past year in this Division.

The Indian and Chinese miners are no longer in evidence on the bars of the Fraser river, which are practically the only places in this Division where placer gold has been found in paying quantities.

Prospecting of a very limited nature with Keystone drill was done on the dredging leases in the Fraser river in the early part of the present winter, and I understand that similar work is to be commenced as soon as the weather conditions will permit.

This, and the necessary work done on one or two mineral claims, represents the total of mining development in this Division for the past year.

OFFICE STATISTICS—CLINTON MINING DIVISION.

Mineral claims recorded	2
Certificates of work	2
Mining leases in force	9
Dredging " "	13
Conveyances recorded	2
Free miner's certificates	$176 75
Mining receipts	438 70

VANCOUVER ISLAND AND COAST.

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ALBERNI DISTRICT.

ALBERNI MINING DIVISION.

H. C. RAYSON, ACTING GOLD COMMISSIONER.

I have the honour to submit my annual report of mining in the Alberni Mining Division during the year ending December 31st, 1909.

There has been more activity in mining this year than during the last preceding years, notably in the neighbourhood of Sechart and Wreck bay, a large amount of development work being done at the mercury claims until bad weather put a stop to operations. These properties have been turned over to the Mercury Mines, Ltd., Co., and give such promising indications as to warrant a further and immediate development on a larger scale. Little has been done in the way of prospecting on the placer leases at Wreck bay. In the Snug basin and Uchucklesat camps, T. H. Knights Bayne has carried on development work on the *Thunderbolt* and *Ivanhoe* groups, with very encouraging results. The claims give indications of copper, with ironstone capping.

On the *Laddie*, *Seattle*, and *Gladys* Mr. Berger has pushed his tunnelling farther, with most encouraging results for copper ore.

The *Defiance* has been surveyed and a certificate of improvements is being applied for. A large amount of development work has been done on this claim, exposing immense bodies of ore; the main outcrop is magnetic iron; on the lower level a tunnel of 30 feet shows ore all through.

On the *Raven*, Messrs. Ward and Rochester have done the necessary amount of assessment work; this also applies to the holders of some thirty other prospects.

Sales and transfers have not been very brisk, but there appears to be a more hopeful feeling about getting capital interested in the further development of some of the prospects.

Coal-prospecting has taken a very decided boom, there being some ninety applications for licences to prospect for coal. These cover ground in the Bamfield, Hesquot, and Quatsino localities, in all of which coal indications are very pronounced.

OFFICE STATISTICS—ALBERNI MINING DIVISION.

Free miner's certificates issued	39
Mineral claims recorded	42
Certificates of work recorded	21
Transfers	19
Certificates of improvements issued	2
Powers of attorney issued	2
" " rescinded	1
Crown-granted mineral claims on roll	179

Revenue.

Free miner's certificates	$ 202 25
Mining receipts, general	254 80
Acreage tax on Crown-granted mineral claims	1,504 25
	$1,961 30

CLAYOQUOT MINING DIVISION.

REPORT OF W. T. DAWLEY, MINING RECORDER.

I have the honour to submit my annual report of the mining operations in the Clayoquot Mining Division for the year ending December 31st, 1909.

During the year very little, if any, prospecting was done, and claims staked have generally been those that have lapsed and reverted to the Crown.

A little work was done for a time on the *Leora* claim, on Elk river, Kennedy lake, owned by Mr. H. E. Gibson, by a party of four who had an option of purchase on same. About 8 tons of ore were taken out and sent to the smelter, giving a return of about $110.75 in gold to the ton. The option, however, was forfeited, and in December D. W. Hanbury and C. H. Bowes, of Victoria, took up an option on the property and men will be sent in early in the year to work it.

On the *Ormond* group, a group of four claims at Ahousat, Flores island, sufficient work was done to make application for a Crown grant.

On the *Copper King*, *No. 1*, *No. 2*, and *No. 3*, which lie close to the *Ormond* group and are owned by Messrs. A. Watson and P. Sullivan, of Alberni, open cuts, tunnelling, and considerable surface work was done to cover the annual assessment work.

On the *Golden Cache* and *Brown Jug*, at Hesquiat lake, owned by Arthur Norris, Alberni, some 15 feet of tunnel was driven.

On the *Two Kallapa* and *Golden Gate*, Disappointment inlet, owned by John Chesterman, of Clayoquot, 20 feet of tunnelling was done.

On the *Victoria* and *Prince Alfred*, on Clayoquot river, and owned by P. and A. Wollan, work consisting of a 16-foot open cut and 8 feet of tunnel was done.

The *Roosevelt*, on Elk river, owned by P. J. Wollan, of Clayoquot, did 16 feet of open cut.

On the *Iron King* and *Pete*, at Ahousat, owned by W. J. Wilson and Capt. J. Irving, of Victoria, assessment work was performed by 18 feet of open cut on each.

On *No. 36* mineral claim, owned by H. H. Rhodes, of Clayoquot, and situated on Catface mountain, owing to a landslide, the work done during the year consisted of stripping and removing part of the slide and retimbering tunnel.

On the *Iron Mountain* and *Chieftain* mineral claims, on Elk river, owned by J. Dunsmuir and R. A. Dawley, work consisting of 50 feet of rock work was done to cover assessment work for four years.

On the *Jay Gould*, *Rothschild*, *Lilly May*, *Great Western*, and *Hetty Green*, on Deer creek, owned by J. Thomson, of Alberni, 25 feet of tunnel was driven, besides cutting out trail.

On the *O. K. No. 1*, *O. K. No. 2*, and *O. K. No. 4*, Sandy creek, Kennedy lake, owned by T. G. Norgar, 20 feet of tunnelling was done.

The *Belvidere* and *Annex* claims, on Bear river, owned by A. E. Waterhouse, Alberni, were surveyed during the year.

One hundred dollars each, in lieu of assessment work, was paid on the *Island Belle No. 1* and *Island Belle No. 2*, situated at Elk river, and *Ivanhoe* and *Double Standard*, on Nootka sound, all owned by W. Wilson, Victoria.

Certificates of improvements were issued as follows: *Keiser* mineral claim, Elk river, to James Dunsmuir; *Cinnamon Bear* and *Grizzly Bear*, Elk river, to John Irving and E. Sundvall; *Black Bear*, Elk river, to John Irving; *Stormont*, *Glengarry*, and *Texas*, Head bay, Nootka sound, to James Dunsmuir and C. Dawley; *Ormond*, *Ormond No. 2*, *Ormond No. 2 Fract.*, *and Ormond No. 3*, on Flores island, to T. T. Gardhouse and J. Beck.

OFFICE STATISTICS—CLAYOQUOT MINING DIVISION.

Free miner's certificates issued	27
Mineral claims recorded	21
Certificates of work recorded	37
Transfers, options, etc., recorded	16
Certificates of improvements recorded	11

Revenue.

Free miner's certificates	$127 25
Mining receipts, general	621 40
Total	$748 65

QUATSINO MINING DIVISION.

REPORT OF O. A. SHERBERG, MINING RECORDER.

I have the honour to submit my annual report of the mining operations in the Quatsino Mining Division for the year ending December 31st, 1909.

The mining situation in this Division remains practically unchanged since my report of last year.

The Crown-granted properties, held by companies, are lying idle, and the miners holding claims have not the means to push development work beyond the necessary annual assessment.

Certificates of improvements have been applied for on thirty mineral claims, situated on West arm of Quatsino sound, owned by James A. Moore, of Seattle, Wash.

The coal claims situated on the West arm of Quatsino sound and owned by the Quatsino Coal Syndicate, have been worked with a few men since the latter part of September.

OFFICE STATISTICS—QUATSINO MINING DIVISION.

Free miner's certificates	23
Mineral claims recorded	39
Certificates of work recorded	61
Bills of sale, powers of attorney, etc., recorded	33

Revenue.

Free miner's certificates	$110 00
Mining receipts	388 90
	$498 90

NANAIMO DISTRICT.

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NANAIMO MINING DIVISION.

REPORT OF GEORGE THOMSON, GOLD COMMISSIONER.

SIR,—I have the honour to submit herewith my annual report on the mining operations in the Nanaimo Mining Division for the year ending the 31st December, 1909.

Very little development work has been done during the year on mining properties in this Division, owners of mineral claims being satisfied to do no more work than was necessary to hold them.

The *Malaspina* mine, on Texada island, under the management of Alfred Raper, has progressed satisfactorily, some very good mineral outcrops being uncovered. The owners began a tunnel 9½ feet wide and 7 feet high, and have driven in about 350 feet. They have erected an engine-house 40 by 124 feet, and installed a 50-horse-power boiler and 4-drill compressor and water system. The owners intend pushing the work in the tunnel until the vein which is known to exist on the properties is encountered. The tunnel when completed will be double-tracked. The company sunk a test shaft on the central claim before commencing this tunnel. From twelve to sixteen men have been employed by the company for most of the year.

Marble Bay.

The *Marble Bay* mines belong to the Tacoma Steel Co., and are under the management of A. Grant. Development work on levels Nos. 11 and 12, on the *Marble Bay* mine, has been prosecuted vigorously during the year, with very satisfactory results. The chute of bornite ore encountered on the 860-foot level continues down to the 960-foot level, where it is strong and solid, having a width of 18 feet by a length of 250 feet, and appears to be widening with depth. A winze started at the 960-foot level is down 15 feet in high-grade bornite ore, with every indication that the ore will be richer as depth is attained. The deepest workings are 975 feet below the surface and 923 feet below sea-level. At this depth the richest bornite is obtained. Copper and silver values have steadily increased with depth, while the gold values have been fully maintained. The new plant added during the past year consists of a hoist and cage, both for No. 2 shaft.

Ore shipped during 1909	11,438 tons.
Number of men employed underground	35
" " above ground	12
" " " sorting ore (Chinese)	10

Wages paid are as follows:—

Mine foreman	$5 00 per day.
Shift-boss	4 00 "
Machinist	4 00 "
Hoistman	3 50 "
Blacksmith	4 00 "
Fireman	3 25 "
Topmen	3 00 "
Stationmen	3 50 "
Miners	3 50 "
Muckers	3 00 "
Carpenter	3 75 "
Timberman	3 75 "
Ore-sorters	1 75 "

During the year several claims have been located on Lasqueti island, on the east side, and from reports received are showing up wonderfully well, especially the *St. Joseph* mineral claim, small shipments of ore having been sent from this claim to the smelter at Ladysmith.

OFFICE STATISTICS—NANAIMO MINING DIVISION.

Free miner's certificates (individual)	190
" " (companies)	6
Mineral claims recorded	269
Certificates of work recorded	222
Paid in lieu of work	9
Certificates of improvements	3
Crown grants issued	5
Bills of sale recorded	61

VICTORIA DISTRICT.

VICTORIA MINING DIVISION.

SIR,—I have the honour to submit my mining report for the Victoria Mining Division for the year 1909.

The mining situation in this Division is practically unchanged from that of the two preceding years.

With the advent of a railway to the west coast of Vancouver Island, the chances for progress in mining development are encouraging. It is also likely that during 1910 a large expenditure will be made in the development of some iron properties on the west coast of the Island, which, if they should prove satisfactory, will be the nucleus of a large iron industry.

During the past year some exploitation was made of the Sombrio river, Renfrew District, for placer-mining ground, with encouraging results, and it is probable that during the coming year every effort will be made to prove the value of this discovery.

OFFICE STATISTICS—VICTORIA MINING DIVISION.

Free miner's certificates	540
" " (special)	7
Mining claims recorded	42
Certificates of work recorded	79
Certificates of improvements recorded	7
Conveyances recorded	39

Revenue.

Free miner's certificates	$4,414 58
Mining receipts, general	864 55
Total	$5,279 13

NEW WESTMINSTER MINING DIVISION.

REPORT OF J. MAHONY, MINING RECORDER.

I have the honour to submit the following report of mining operations in the New Westminster Mining Division for the year 1909 :—

The mineral claims recorded during the year were distributed as follows :—

Britannia, Howe sound, and vicinity	46
Bowen island	3
Gambier island	5
Indian river	8
Lynn and Seymour creeks and vicinity	26
Sechelt peninsula	7
Welcome pass	10
Porpoise bay	15
Jervis inlet	48
Pendrill sound	1
Pitt lake	2
Stave lake and vicinity	19
Harrison river and vicinity	10
Harrison lake	19
Agassiz	5
Chilliwhack and vicinity	14
Total	238

There has been a falling off in the number of free miner's certificates issued, and also in the number of certificates of work recorded for the year. There has been a slight increase in the number of claims recorded. There has been considerable activity in prospecting in the vicinity of Jervis inlet, and a number of placer claims have been recorded on Canyon creek, at the head of Jervis inlet, but no report has reached me as to whether the claims have proved successful or not. Very little work has been done in developing claims in the District, other than to keep them in good standing.

OFFICE STATISTICS—NEW WESTMINSTER MINING DIVISION.

Free miner's certificates issued	1,460
Quartz claims recorded	238
Certificates of work recorded	250
Certificates of improvements recorded	13
Conveyances recorded	69
Placer claims recorded	64

Revenue.

Free miner's certificates	$ 8,583 95
Mining receipts	2,301 95
Total	$10,885 90

BUNKERS AND WHARF OF PACIFIC COAST COAL MINES, LTD., BOAT HARBOUR, VANCOUVER ISLAND.

INSPECTION OF METALLIFEROUS MINES.

Since the beginning of the year 1909 a change has been made in the system of mine inspection, by the appointment of a Chief Inspector of Mines, Mr. Francis H. Shepherd, with headquarters at Nanaimo, who has direct charge and control over the District Inspectors, who report to him direct.

WEST KOOTENAY AND BOUNDARY DISTRICTS.

Report of James McGregor, Inspector.

I have the honour to submit my annual report for the year 1909, with respect to the condition of the metalliferous mines in my Inspection District.

Nelson District.

In this District there has been a considerable increase in the number of mines in active operation, others being developed with satisfactory results; also much prospecting, especially in the Sheep creek section. Upon inspection of the mines which come under the Act, I found the conditions in accordance with the regulations.

Rossland District.

The number of shipping mines in this District remains about the same as last year. The output of most of them has increased considerably, also extensive development work is always in progress. Upon inspection of the mines and machinery, I have always found every care being taken to keep the mines in a safe condition.

Similkameen District.

The number of shipping mines in this District remains about the same. A greater amount of prospecting and developing has been in progress during the year. I have found, upon inspection, every care being exercised with regard to safety.

Lardeau District.

The number of shipping mines in this District has not increased during the year, but much has been accomplished in the way of developing. The operating mines I have found, upon inspection, in a safe condition.

Kamloops District.

The principal work done in this District during the year has consisted of prospecting and developing.

Slocan District.

There has been considerable improvement in this District during the year. The number of mines in operation is on the increase over last year. Upon inspection, I have found them conforming to the Act.

Boundary District.

There has been much activity in mining in this District and a much larger increase in the output during the year; also the development work accomplished was considerably more than previous years.

EAST KOOTENAY DISTRICT.

REPORT OF THOMAS MORGAN, INSPECTOR.

I have the honour, as Inspector of Metalliferous Mines for the East Kootenay District, to submit my annual report for the year 1909.

The *St. Eugene* and the *Aurora* mines, at Moyie, and the *North Star* mine, at Kimberley, have been working continuously during the year; the *Sullivan* has not started to ship ore, but is being prepared to do so by getting the water out and putting the mine in shape.

These are the only mines working in this District, and I have always found all to be well timbered, and the requirements of the "Inspection of Metalliferous Mines Act" carried out as nearly as reasonably possible. The mines are ventilated by natural draft, assisted by compressed air and fans in places where required.

I have no accidents to report this year.

INSPECTION OF COAST DISTRICT.

The Inspector, Mr. Archibald Dick, writes that he has two accidents to report as occurring in the metalliferous mines within his District during the past year, but has no report to make, as he has been unable to visit any of the properties this year.

LIST OF ACCIDENTS IN METALLIFEROUS MINES, 1909.

Inspector Thomas Morgan has no accidents to report for the East Kootenay District.

Reported by James McGregor, Inspector, West Kootenay and Boundary Districts.

No.	Mine.	Date.	Name.	Occupation.	Details.
1	Jewell, Boundary.....	Jan. 23	Robert Barrow	Miner	While removing stump, face and eye were injured by exploding powder.
2	Mother Lode, Green-wood	Feb. 6	J. K. Hall	"	Killed by falling down chute.
3	Granby, Phœnix.....	Mar. 1	Patrick Killan.	"	Killed by falling off a bench.
4	"	" 26	Anton Cerva ..	Chuteman's helper	Foot crushed in chute and amputated.
5	"	April 3	A. Hosdvoski..	Shoveller ..	Leg broken by rock in chute.
6	"	" 29	Leo. J. Stalls..	Locomotive engineer	Severely crushed between locomotive and timbers.
7	Old Ironsides, Phœnix..	May 2	Warren Mit-chel	Nipper	While carrying steel, sustained fractured jaw, fractured forearm, fractured scapula.
8	Carbonate, M. C.....	" 10	John Buckly ..	Miner	Severely injured by powder exploding while being thawed.
9	Snowshoe, Phœnix.....	" 16	James Berry ..	Labourer ...	Killed by falling gravel in open cut.
10	Arlington, Erie	June 24	Ed. Stickles...	Miner	Leg broken by fall of ore.
11	Granby, Phœnix.....	Aug. 6	Charles Taylor	Carpenter's helper	Fatally injured by falling off trestle at waste-dump.
12	Mother Lode, Green-wood	" 18	Peter Boydonic	Miner	Fatally injured by being forced over bench by slab of rock falling from side wall.
13	Old Ironsides, Phœnix..	Sept. 1	James Twigge.	"	Leg fractured by rock in chute.
14	Granby, Phœnix.....	" 11	H. Edwards...	Ore-loader ..	Head injured by falling from ore-bins into car.
15	Le Roi No. 2.....	" 29	W. Novaick...	Car-loader ..	Fatally injured by falling on pipe.
16	Old Ironsides, Phœnix..	Oct. 1	Axel Liljenberg	Miner	Fatally injured, jammed between car and side of drift.
17	Surprise, Sandon	" 5	Oscar Johnston	"	Killed by picking into unexploded powder.
18	Le Roi No. 2.....	" 11	M. Mibrovich .	Cage-tender .	Injured thumb while handling steel.
19	Mother Lode, Green-wood	" 23	G. Jampiere...	Miner	Both legs fractured, fell down ore-pile.
20	" "	Dec. 10	W. T. Ennis..	"	Killed by rock rolling down ore-pile.
21	Gold Drop	" 17	Fred. Stritzel .	Shoveller ...	Eyes and head injured by flying rock.
22	Granby, Phœnix.....	" 17	Jim Milich....	Chuteman ..	Ankle broken by rock in chute.
23	"	" 23	F. Mulkovitch.	Miner	Fatally injured by flying rock.

REPORTED BY A. DICK, INSPECTOR, COAST DISTRICT.

No.	Mine.	Date.	Name.	Occupation.	Details.
1	Ikeda	Feb. 9	Ikeda yu Rimo	Miner	Killed by explosion of powder, caused by his picking at the powder with his candlestick.
2	"	May 20	Joseph Marko.	Superintend-[ent	Went into mine to investigate a missed-fire shot, and being overcome with powder-smoke fell in ditch of 2 inches of water and was drowned.

TABULATED LIST OF ACCIDENTS IN METALLIFEROUS MINES, 1909.

	Cause of Accident.	Extent of Injury.			Total.
		Fatal.	Serious.	Slight.	
A	Blasting	1	2	0	3
B	Defective powder	0	0	0	0
C	Drilling into old holes containing powder	0	0	0	0
D	Powder in muck	1	0	0	1
E	Shafts and cages, accidents connected with	0	0	0	0
F	Falling down shafts or winzes	1	0	0	1
G	Falling down chutes	0	1	0	1
H	Mine cars	1	1	0	2
I	Rock falling in stopes, levels, etc	1	1	0	2
J	Rock falling down chutes or openings	3	0	0	3
K	Timbering	0	0	0	0
L	Miscellaneous, underground	4	2	1	7
M	Miscellaneous, surface	3	2	0	5
	Totals	15	9	1	25
Accidents for each 100,000 tons ore mined		0.8	0.4	0.05	1.25
Accidents for each 1,000 men employed		4.9	2.9	0.33	8.13

COAL-MINING IN BRITISH COLUMBIA.

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By W. F. Robertson, Provincial Mineralogist.

The coal-mines of the Province have, for many years, been sufficiently developed to supply the domestic demand, and they, therefore, have had to look to the export market to increase their sales: unlike the metalliferous mines, whose product is taken to the market to be sold, the coal-mines must wait until the market comes to them, or within their reach. The market for coal is, therefore, directly dependent upon, and in proportion to, the industrial activity of the district supplied, and, to a certain extent, may be taken as a measure of such activity. The greater market for coal must come from an increased activity and growth within the field of possible operations, and the widening of such a field by the increasing facilities of transportation, which enable more remote points to be profitably reached, so enlarging the field as to include new markets.

This enlarging of the market must necessarily be gradual in a new country—and all the Pacific Coast is industrially new—but that an increase has taken and is taking place, a glance at the coal statistics will show. This increase has been fairly regular, amounting to an average yearly increment of between 50,000 to 60,000 tons of coal, while at the same time, in ten years, the annual output of coke has increased from 35,000 tons to 258,703 tons, due to the growth of a special industry—ore-smelting.

The gross coal output of the collieries of the Province for the year 1909 was 2,400,600 tons (2,240 lbs.), the greatest they have ever made in any year. Of this amount, 2,006,476 tons was used as coal valued at $7,022,666, while 394,124 tons was consumed in making coke, of which there was produced during the year 258,703 tons (2,240 lbs.), worth $1,552,218, making the total value of the products of the collieries $8,574,884, an increase over that of 1908 of $1,218,018, or about 16.5 %.

The greater percentage of the output for 1909, as formerly, was from the Crow's Nest Pass Coal Company's mines in East Kootenay, and from the collieries of the Western Fuel Company and the Wellington Colliery Company on Vancouver Island.

In addition to these larger producers, very appreciable shipments were made by the Hosmer Mines, Limited, and the Corbin Coal and Coke Company in East Kootenay; by the Nicola Coal and Coke Company, of Nicola; and by the Pacific Coast collieries and Vancouver and Nanaimo Coal Company, of Vancouver Island.

The old Gilfillan Colliery, of Nanaimo; the Diamond Vale Colliery, of Nicola; and the Vermilion Forks Colliery, of Princeton, made small shipments.

The supply of coal immediately available in the Province seems to be greatly in excess of any present or prospective needs, while that of the partly developed fields, not yet producing, seems unlimited; this is particularly true of the Rocky Mountain coalfield, on which a special report will be found following.

During the year 1909 about 40 % of the total coal sold by the British Columbia collieries was exported to the United States, as was about 16.1 % of the coke sold; the export trade to other countries was insignificant.

The East Kootenay collieries exported to the United States about 72 % of the coal and about 18 % of the coke they sold, while the Coast collieries exported to the same country about 27.3 % of their coal.

Formerly, in 1902, the Coast collieries exported to the United States 75 % of their coal, but the percentage exported since then has been gradually diminishing, owing to the increasing home market and to the use of crude oil in California.

The distribution of this output of coal and coke is shown in the following table:—

COAL AND COKE PRODUCED, EXPORTED, &c., BY PROVINCE DURING YEAR 1909.

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	998,494		210,884	
" export to United States	678,137		40,478	
" " to other countries	63,509		142	
Total sales		1,740,140		251,504
Used in making coke	394,124			
Used under colliery boilers, etc.	260,554			
Total for colliery use		654,678		
Stocks on hand first of year	42,260		9,550	
" last of year	48,042		16,749	
Difference added to stock during year		5,782		7,199
Output of collieries for year		2,400,600		258,703

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, &c.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and clerical assistance	122		93		215	
Whites—Miners	2,285		9		2,294	
Miners' helpers	721				721	
Labourers	753		466		1,219	
Mechanics & skilled labour.	590		492		1,082	
Boys	149		66		215	
Japanese	70		55		125	
Chinese	20		524		544	
Indians	3				3	
Totals	4,713		1,705		6,418	

COLLIERIES OF THE COAST DISTRICT.

The gross output of the Coast collieries, including the Nicola valley, for the year 1909, was 1,476,735 tons (of 2,240 lbs.) of coal actually mined, while some 5,217 tons were added to "stock," making the actual consumption of coal 1,471,512 tons.

Of this gross consumption, 1,250,345 tons were sold as coal, 192,384 tons were consumed by the producing companies as fuel, while 28,660 tons were used in making coke, of which there was produced some 13,686 tons (2,240 lbs.), of which 5,493 tons was sold and 8,193 tons added to stock.

The following table gives an aggregate summary of the output of the Coast collieries for the year 1909 and shows the dispositions made of such product:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	862,088		5,493	
" export to United States	324,748			
" " other countries	63,509			
Total sales		1,250,345		5,493
Used in making coke	28,660			
" under colliery boilers, etc	192,384			
Total for colliery use		221,044		
Stock on hand first of year	41,158		8,287	
" last of year	46,504		16,480	
Difference added to stock during year		5,346		8,193
Output of collieries for year		1,476,735		13,686

Number of Hands Employed, Daily Wages Paid, &c.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and clerical assistance	62		56		118	
Whites—Miners	1,479		9		1,488	
Miners' helpers	551				551	
Labourers	551		96		647	
Mechanics and skilled labour	114		224		338	
Boys	126		51		177	
Japanese	70		55		125	
Chinese	20		524		544	
Indians	3				3	
Totals	2,976		1,015		3,991	

COLLIERIES OF THE EAST KOOTENAY DISTRICT.

The gross output of the collieries of the East Kootenay District for the year 1909 was 923,865 tons (2,240 lbs.) of coal actually mined, of which 436 tons were put into stock, making the actual consumption of coal 923,429 tons. Of this gross consumption of coal, 489,795 tons were sold as coal, 68,170 tons were consumed as fuel by the producing companies, while 365,464 tons were converted into coke, of which there was produced 245,017 tons, while 994 tons of coke were taken from stock, making the coke sales for the year 246,011 tons.

The following table gives an aggregate summary of the output of the East Kootenay collieries for the year 1909 and shows the dispositions made of such product:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	136,406		205,481	
" export to United States	353,389		40,478	
" " other countries				
Total sales		489,795		245,869
Used in making coke	365,464			
Used under colliery boilers, &c	68,170		142	
Total for colliery use		433,634		142
				246,011
Stock on hand first of year	1,102		1,263	
" last of year	1,538		269	
Difference { *added to / †taken from } stock during year		*436		†994
Output of collieries for year		923,865		245,017

Number of Hands Employed, Daily Wages Paid, &c.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and clerical assistance	60		37		97	
Whites—Miners	806				806	
Miners' helpers	170				170	
Labourers	202		370		572	
Mechanics and skilled labour	476		268		744	
Boys	23		15		38	
Japanese						
Chinese						
Indians						
Totals	1,737		690		2,427	

COAL-PROSPECTING ON TUMBO ISLAND.

Tumbo island is a small island in the Straits of Georgia just east of Saturna island, and is the most easterly of the group of smaller islands lying along the eastern shore of Vancouver Island. The coal formation of Vancouver Island has been found to extend to this most easterly of the islands, where it is now being bored by diamond drill in an endeavour to find commercial coal. As a geological record this bore-hole may be of use in other prospecting ventures, so Mr. William Blakemore, of Victoria, the consulting engineer of the syndicate, has kindly supplied the following record of the bore-hole:—

Depth.	Character of Strata.	Thickness.
Ft. in.		Ft. in.
0 0	Surface wash composed of gravel, sand, boulders, and clay—pitching to N.W.—$\frac{3}{4}$in. to foot	19 0
.....	Sandstone, grey	5 0
.....	Shale, with slight showing of coal	1 2
.....	Sandstone, grey	1 0
.....	Conglomerate with small streaks of coal	5 0
.....	Sandstone, grey	4 0
.....	" "	27 0
.....	" "	20 0
.....	" and shale	1 6
92 0	"	8 6
.....	" spotted with streaks of coal	42 0
.....	Slate or sandy shale, grey	1 0
138 0	Sandstone	3 0
.....	Conglomerate	3 0
162 0	Sandstone	21 0
.....	"	1 0
166 0	Conglomerate	3 0
183 6	Sandstone	17 6
184 0	Slate	0 6
234 6	Sandstone	50 6
244 6	"	10 0
.....	"	4 0
249 0	Slate or shale	0 6
159 0	Sandstone	10 0
269 0	" with showing of lignite, coal in streaks	10 0
279 0	" with 4 ft. of fine conglomerate between	10 0
282 0	"	3 0
282 6	Lignite	0 6
285 0	Sandstone	2 6
256 6	"	1 6
287 0	Shale or slate	0 6
296 0	Sandstone	9 0
307 0	" with some conglomerate	11 0
313 0	"	6 0
325 0	" with some conglomerate intermixed and soapstone	12 0
355 0	" " " " " " " "	30 0
397 6	"	42 6
437 0	"	39 6
449 0	"	12 0
452 0	Grey shale or soapstone	3 0
452 6	Sandstone	0 6
453 0	Conglomerate	0 6
455 2	Sandstone	2 0
465 0	"	10 0
475 0	"	10 0
485 0	"	10 0
493 0	"	8 0
494 0	Dark-grey shale with streaks of coal	1 0
495 0	Sandy shale	1 0
495 0	Sandstone	1 0
505 0	"	9 0
510 0	Conglomerate	5 0
515 0	Sandstone	5 0
524 0	"	9 0
525 0	Conglomerate	1 0

LOG OF BORE-HOLE ON TUMBO ISLAND—*Concluded.*

DEPTH.		CHARACTER OF STRATA.	THICKNESS.	
Ft.	in.		Ft.	in.
535	6	Sandstone	10	6
545	6	"	10	0
556	0	Coarse sandstone	10	6
558	0	Sandstone	2	0
560	0	Conglomerate	2	0
567	0	Sandstone	7	0
579	6	"	12	6
586	0	Conglomerate with showing of coal	6	6
589	0	Sandstone	3	0
591	0	Conglomerate	2	0
591	6	"	0	6
600	6	Sandstone	9	0
601	6	Conglomerate	1	0
613	0	Sandstone	11	6
617	0	Conglomerate	4	0
628	0	Sandstone	11	0
639	0	"	11	0
649	0	"	10	0
669	0	"	20	0
679	0	"	10	0
686	0	", seamed with coal from ¼ to ½ inch 6 inches apart	7	0
699	0	"	13	0
713	0	"	14	0
718	0	"	5	0
718	8	Shale	0	8
719	6	"	10	0
724	6	"	5	0
725	0	"	0	6
730	0	Sandy shale or slate	5	0
731	0	Shale	1	0
732	0	Sandy shale or slate	1	0
734	6	" " "	2	6
738	4	Shale	3	10
740	4	Sandy shale or slate	2	0
742	0	Shale	1	8
750	6	"	8	6
754	0	"	3	6
762	0	Very fine sandy shale or sandstone	8	0
763	0	Sandstone	1	0
763	8	Very fine sandy shale or sandstone	0	8
764	8	Sandstone	1	0
769	2	Sandy shale or sandstone, fine	4	0
771	2	Sandstone with 2 in. seam of shale	2	0
772	0	Brown shale	10	0
773	6	Grey shale	1	6
782	0	Grey sandstone, both with showings of coal	8	6
784	6	Sandstone	2	6
		At this depth the drill encountered a tremendous pressure of water of gas, shooting the water out of the hole to a height of 25 feet. Upon the rods being withdrawn from the hole I was able to ignite with a match whatever gas it was and it burnt steadily.		
803	0	Blue-black shale	8	0
809	0	" "	6	0
813	6	" "	4	6
819	6	" "	6	0
823	0	" "	3	6
833	0	" "	10	0
844	0	" "	11	0
850	0	" "	6	0
858	0	" "	8	0
895	0	Black shale, with here and there 2 in. sandstone. 860 ft. Not much core saved but cuttings to 895 ft.	2	0
874	0	Black and grey shale with coal in streaks	14	0
882	0	Coal with thin streaks of black and grey shale	8	0
883	0	Green-grey sandy shale	1	0
889	6	" " "	6	6
892	6	Green shale	3	0
895	0	Fine grey sandstone	2	6

THE ROCKY MOUNTAIN COALFIELDS.

Notes by W. F. Robertson, Provincial Mineralogist.

The Rocky mountain coalfields, lying on either flank of the main range of the Rocky mountains, respectively in the Provinces of British Columbia and Alberta, are undoubtedly the most extensive coal-deposits in Canada, and, what is more important from a commercial point of view, are the only large coalfields of first-class coal at present known on the Pacific Slope between Alaska and Mexico.

While it has been a matter of common knowledge in British Columbia that these deposits were large, it is questioned if more than a few people recognised their wonderful extent, or, the enormous influence which they must have on the future of the country. What this influence must be, can best be demonstrated by the illustration of what the coal-deposits of Pennsylvania have done for that State—they have made it probably the greatest manufacturing State of the Union—and the condition of Western Canada to-day is that of the Eastern United States fifty years ago, except that we may look forward to a more rapid development, due to the more general development of the rest of the continent and the improved transportation and other facilities now available.

It seems, therefore, that Eastern British Columbia is destined to be, from the possession of its coalfields alone, the Pennsylvania of the Pacific Slope, and that at no distant date.

The extent and importance of the Rocky mountain coalfields has been recently set forth in a Report by D. B. Dowling, of the Geological Survey of Canada,* which also shows that the great prairie country to the eastward is amply provided with an abundance of lignitic coals and lignites, which, while inferior in quality to the Rocky mountain bituminous coals, are admirably suited for domestic purposes, and will, in all probability, eventually supply that demand in the district in which they are located.

The Geological Survey has been for years past investigating these coalfields, and Mr. Dowling gives, as the result of such investigation, an estimate of the workable seams therein contained that is astonishingly large.

In this estimate of the coal Mr. Dowling gives—to quote from his Report—"what might be called the maximum value from the knowledge we now possess. The minimum will only be arrived at after years of prospecting, and will, we hope, be well up to the present estimate. In the small, rich areas in the mountains the measures are best exposed, so that from these a better estimate of the coal content can be made. . . . For the limited areas, where heavy seams are known, the estimate is probably low enough," &c.

These quotations have been selected as applying to the field under discussion. The figures of content given by Mr. Dowling are made up from known sections of the measures, assuming this section to rule throughout the demonstrated area of the field, from which he has made a liberal deduction for waste, &c.; as, for example, in the Fernie section he finds there are "twenty-two workable seams with a total thickness of 216 feet of coal, 100 feet of which are estimated as workable."

* "The coalfields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia," by D. B. Dowling, April, 1909, being Bulletin No. 1,035 of Geological Survey Branch of Department of Mines, Ottawa.

In the upper Elk river coalfield, in the Aldridge creek section, he finds a number of workable seams which aggregate a thickness of 163 feet of coal, basing his calculations on the assumption that, of this thickness, 100 feet can be extracted.

To arrive at the amount of coal that will ultimately be extracted from these areas, a deduction of a certain percentage will have to be made for coal lost in working, and what this percentage will be, will depend somewhat upon the method employed in extraction. According to this Report the following are the known coalfields flanking the Rockies :—

	Area, Square Miles.	Maximum Contents, Tons.
EASTERN BRITISH COLUMBIA :		
Crow's Nest Pass area	230	22,000,000,000
Upper Elk area	140	14,000,000,000
ALBERTA :		
Coleman area	45	2,000,000,000
Blairmore-Frank area	50	1,500,000,000
Livingstone area	60	1,500,000,000
Moose Mountain area	15	150,000,000
Cascade area	40	1,600,000,000
Palliser area	6	20,000,000
Costigan area	12	60,000,000
Bighorn area	60	1,400,000,000
	658	44,130,000,000

Of this forty-four billion tons of coal estimated, as at present known, some thirty-six billion tons, or 81 % of the whole, is in British Columbia, practically all of it available from the valley of the Elk river. This coal is all bituminous coal of a high grade, as analyses given later show, while a large proportion of it is excellent coking-coal.

GEOLOGY OF COALFIELDS.

The coal-bearing measures of Eastern British Columbia and of the Provinces of Alberta and Saskatchewan have all been placed by the Geological Survey as belonging to the Cretaceous period, a formation much younger in age than the Carboniferous, which is the coal-bearing formation in Eastern America and Great Britain.

"The coal is found in three distinct formations, in the Cretaceous, separated by shales of marine origin. The lowest is practically the base of the formation, and is considered Cretaceous from its fossil flora; though it lies just above the Fernie shale, now understood to be of Jurassic age. The line of demarcation is not very sharp, as the shales in their upper part become interstratified with sands, and gradually pass into a sandstone formation containing coal-seams—called by Dawson the Kootanie."

The three coal horizons are as follows (in descending order): (1.) Edmonton formation of Alberta. (2.) Pelly River (Judith River formation). (3.) Kootanie formation.

The coal-bearing measures of Eastern British Columbia belong to the Kootanie formation, while the coal-deposits, much farther north in the valley of the Peace river in British Columbia, belong to the Pelly River formation.

Kootanie Formation.—The lowest number of this series of deposits is found resting upon the Jurassic in the Rocky mountains. In the Rocky mountains the base of the formation is a heavy bed of sandstones and shales containing many coal-seams. The maximum deposition during this period was west of the axis of the Rocky mountains. In the Elk river escarpment the formation measures 5,300 feet in thickness. East of this, at Blairmore, it is reduced to 740 feet.

Structural Geology.

The structure of the region can only be briefly outlined. The subsidence, during Palaeozoic time of parts of the central continental area, is shown in the marine limestone outcropping in Manitoba and the Rocky mountains. Afterward, the depressions in which Mesozoic rocks were deposited first appeared in the longitude of the Rocky mountains, and Triassic and Jurassic beds are there found. Early Cretaceous depositions occur in the same district, following a shallowing of the sea, in which very little of the present continent was submerged. Land conditions prevailed throughout portions of the early Cretaceous, but the occasional submergence extended a short distance east of the mountains.

"Towards the close of the Laramie period the transfer of the great mass of deposits that had proceeded through Cretaceous times began to unsettle the equilibrium of the area from which they were derived, and the crustal movements which ended in the forcing-up of the Rocky mountains there commenced."

General Character of the Coals.

As is often found, the character of the coal varies with the age of "the formation and amount of covering beds. In this case the general law holds, but a far more important element has also influenced the alteration."

"The lateral disturbance and pressure in the formation of the Rocky mountains has made a great change in the character of the coal."

Kootanie Formation.

"This being the base of the Cretaceous, and near the limestone-beds which represent the Carboniferous and Devonian, is exposed only in and near the Rocky mountains."

The faults and uplifts which bring up the limestone-beds have also elevated these coal-measures, but a great part has been denuded. Within the mountains the coal-measures are generally found in long narrow strips between the ranges.

In addition to the Alberta areas, the Kootanie is also found on the western slope within the Province of British Columbia. This is the Elk river, or Crow's Nest, field—perhaps the most important in Canada.

The base of the measures is generally marked by a heavy bed of sandstone, above which is a succession of sandstones and shales, rich in coal-seams, varying in thickness in the different fields. The top of the formation where the coal-seams are found is marked by conglomerates, coarse in the southern areas, but finer toward the north.

BRITISH COLUMBIA AREAS.

The areas in British Columbia, on the Elk river, are divided into two portions. The southern one—for which Fernie is the largest shipping point—has a length, north and south, of about thirty miles, and a maximum width of twelve or thirteen miles, with an estimated area of 230 square miles.

The coal-bearing rocks have in several sections been found to have a thickness as great as 4,700 feet. In this area there are twenty-two workable seams, with a total of 216 feet of coal, 100 feet of which are estimated as workable. This would give a total workable coal content of 22,600,000,000 tons.

The coal is high-grade bituminous, occasionally running into anthracitic. The majority of the seams are used for the manufacture of coke, but steam-coal is a product as well. The collieries are situated at Coal creek (near Fernie), Michel, Morrissey, and Hosmer. The northern part of this field extends from about twenty-four miles north of Michel creek to the

height of land at the Kananaskis river, a distance of nearly forty miles. The width does not exceed seven miles as a maximum, and towards the north diminishes to a vanishing point at the source of the Kananaskis river.

The area has been computed to be 140 square miles, and the number of workable seams is large. In one place, Aldridge creek, for example, it is estimated at sixteen square miles, with a total thickness of 163 feet of coal. If 100 feet be extracted, then, on the assumption that the whole 140 square miles is of equal value, the total coal may be estimated at, say, 100,000,000 tons per square mile, or a total of 14,000,000,000 tons.

Both the coal-areas in British Columbia are tributary to the Elk river, being located on its eastern slope and on tributary streams flowing in from the east. These two areas are, undoubtedly, of the same geological horizon, and were probably at one time parts of a continuous series of beds; but subsequent geological action and denudation have removed a section of the measures, until now they are separated by an interval of about twenty-four miles of country, barren of coal, thus making two separate coalfields—the Southern, or Crow's Nest, field, and the Northern, or Upper Elk river, field.

The former field has been extensively prospected, and has been under active development for the last twelve years; it is amply provided with railway facilities, and has been for eleven years a constant producer of coal. The latter field has been pretty well surveyed and mapped, but as yet has only been prospected, and, although considerable work has been done there, it has been of a nature merely to prospect the field and not to produce coal.

Southern, or Crow's Nest, Area.

This coal-area extends in an east and west direction from the Elk river eastward to the boundary of the Province, the summit of the Rocky mountains, extending into the Province of Alberta to an extent small only by comparison. In a north and south direction the field extends from the hills south of Morrissey creek northwards, and includes the hills north of Michel creek.

The area of the field is given by the Geological Survey in 1890* "as approximately 230 square miles; its greatest length is about thirty-five miles north and south, and its greatest width about thirteen miles." Subsequent work has proven the coal-measures to extend farther east than was then known, which might somewhat increase the area.

The best exposures of the measures are in the escarpment which runs parallel with the Elk river on its eastern side, and here, near Fernie, the greatest amount of development has taken place. In a section of the formation at this point given by Mr. McEvoy,* it is shown to have a thickness of some 4,736 feet—in which were found twenty-four seams of coal aggregating a thickness of 216 feet of coal.

The grouping of the seams in the formation is such that in a thickness of measures of 1,847 feet there is found a thickness of some 198 feet of coal, in eighteen seams varying in thickness from 1 foot to 46 feet, of which, however, some ten are at least 4 feet in thickness.

In forming an estimate of the quantity of workable coal in the area, of the total thickness of 216 feet of coal, it has been assumed, for purposes of calculation, that 100 feet in thickness extends over the whole area and is workable, on which basis it is calculated that there is in the Crow's Nest area 22,600,000,000 tons of coal. This coal is all bituminous, and most of it is suitable for coke-making, although some of the larger seams at Morrissey will not make coke, as the coal is too high in fixed carbon and too low in volatile matter.

* Summary Report Geological Survey of Canada, 1900, p. 85.

Transportation Facilities.

The Crow's Nest branch of the Canadian Pacific Railway, crossing over the summit from Alberta, follows down Michel creek, which creek cuts right through the northern edge of the Southern coalfield, and continues down the valley of the Elk river. From these streams and railway all the coal-seams are accessible by short branch roads. The railway gives connection with the metalliferous mining camps of Nelson, Rossland, and the Boundary, while a branch line starts off at Yahk, giving an outlet for the coal to Spokane, Washington, and the country tributary.

In addition to this, the Great Northern Railway has run a branch from Rexford Junction, on the main line in Montana, crossing the International Boundary at Gateway, following up the valleys of the Kootenay and Elk rivers, and continuing past Morrissey and Fernie to Michel, at which three points it makes connection with the coal company's branch lines. This branch has been built with great regard to easy grades, and, having a continuous down-grade to the main line, it is no unusual sight to see one locomotive pulling a train of seventy-five 40-ton cars down, or one hundred empties up.

Developed Collieries.

The Southern field was opened up first by the Crow's Nest Pass Coal Company, a company which now holds some 64,000 acres of coal lands in the area. This company in 1898 opened up its first colliery on Coal creek, a creek which, flowing from the east into the Elk river at Fernie, cuts by its valley through the coal-measures nearly at right angles to the strike of the seams, so cutting the seams that they outcrop at either side of the creek valley, dipping to the east.

Coal Creek Colliery.

At a distance of some five miles up this creek from Fernie and the Elk river, the first coal-seams were opened up in 1898 by adit tunnels running in on the strike of the coal from either side of the creek, and these have since developed into very extensive workings, extending, in the No. 2 mine, for a distance of about 5,000 feet in from the outcrop.

On the south side of Coal creek, Mines No. 2 and No. 6 have been opened up, and on the north side, Mines No. 1, No. 5, No. 9, No. 11, and No. 12, the two latter being in underlying seams outcropping about two miles farther down the valley than the seams first opened up.

All the mines, except Nos. 11 and 12, which are not now working, are connected by surface trams with a general tipple, which extends across the valley of the creek, all the mine tunnels being on the level of the upper floor of the tipple. The tipple, originally built of wood, was replaced a few years ago by a thoroughly up-to-date steel structure, fully equipped with all requisite dumps and screens operated by electricity. The branch line of railway from the mines to Fernie is owned and operated by the coal company, and connects at Fernie with the Canadian Pacific Railway and the Great Northern Railway.

The outside haulage at the mine is by electric motor and the inside haulage by compressed-air locomotives, supplemented on the auxiliary haulage-roads by horses.

Each mine is supplied with an efficient exhaust for ventilation, driven by steam, supplied from a central steam plant. The colliery is equipped with permanent and substantial power plant, machine and repair shops, etc.

While a number of the operators live at Coal Creek, where the company has a number of cottages, the majority of the men live at Fernie, to and from which point they are conveyed free on the company's railway.

The seams have all been worked on the pillar-and-stall system, with the exception of No. 9 mine, which was operated by the long-wall system, the latter system being found most efficient as regards safety and percentage of coal recovered, but was abandoned on account of, it is understood, the high cost of mining.

The mines starting in from the outcrop, run under the mountain, soon reaching a thickness of cover up to 3,000 feet. The overlying measures are very tough and strong shales and conglomerates, which form an excellent roof to the seams, but offer some difficulty when pillars are withdrawn, inasmuch as they do not "cave" as a shale roof would, but, settling as a solid sheet, produce such pressure in the district surrounding the area of pillar-extraction as to cause what is locally known as "bumps"—the feature of which is the upheaval of the softer underlying shale with the sudden liberation of considerable quantities of gas. The mines are inclined to be quite "gassy" and the coal is inclined to make dust, demanding considerable skill and eternal watchfulness on the part of the management.

At Fernie the company has erected a large number of beehive coke-ovens, and made during the past year 117,268 tons of coke.

The following is the record of production of the Coal Creek Collieries since they were opened:—

Year.	Gross Annual Output Coal, 2,240 lb. Tons.	Annual Output Coke.	Men Employed.		Total.
			Underground.	Surface.	
1898	9,954	361	74	49	123
1899	102,610	29,658	274	97	371
1900	196,837	65,915	330	65	395
1901	322,245	111,683	670	150	820
1902	238,776	78,490	451	110	561
1903	215,791	84,321	353	88	441
1904	345,901	118,551	610	137	748
1905	425,493	123,593	530	210	740
1906	426,793	93,171	799	318	1,117
1907	522,783	88,775	814	378	1,192
1908	441,003	102,322	669	268	937
1909	379,968	117,268	658	262	920

Carbonado Colliery.

Carbonado Colliery, also operated by the Crow's Nest Pass Coal Company, is situated on Morrissey creek, about four miles from its junction with the Elk river. Morrissey creek forms the southern boundary of the company's coal-areas, and these workings are all on the north side of the creek.

From a point where the uppermost worked seam outcrops in the creek bed, a tram-line has been built, following the contour of the hill westward towards the main valley, connecting with the head of a self-acting incline by which the mine-cars were lowered to the tipple level, the tipple being located as far up the creek valley as space, and a regard for railroad grades, would permit.

This colliery was opened up in 1901, and the first coal shipped from it in 1902. The following seams were opened up by tunnels driven in from the outcrops along the strike of the seams: No. 1, 12 feet thick; No. 2, 30 feet thick; No. 3, 4½ feet thick; No. 4, 16 feet thick; No. 5, 18 feet thick. There are other known seams, both above and below these, which were not developed by the first plans.

These seams were found to dip at a moderately steep angle, and the coal was found, in the larger seams especially, to have been subjected to geological crushing movement, or other cause, which rendered it very flaky and friable, so that run-of-mine coal produced a very small percentage of screened coal; in fact, most of the coal mined was too fine to be used on an ordinary grate of a boiler.

The quality of the coal, as far as analyses could show, was excellent for steaming purposes, but, being rather high in fixed carbon, and consequently low in volatile combustibles, it was found not to be suitable for coke-making, although this latter fact does not seem to have been recognised until after some 210 coke-ovens were built, on the strength of one of the smaller seams first opened having produced a very fair coking-coal.

To add to these difficulties, as the seams were worked into some distance they were found to give off an abnormal amount of gas, and, despite the fact that the mines were eventually only worked in a pair of drivages for development, tremendous outbursts of gas occurred near the new faces without apparent cause or warning, resulting in a number of men being smothered, but it speaks well for the management and the safety-lamps (Wolf) employed, that none of these gas-outbursts were ever ignited or exploded.

In 1906 the colliery remained idle for some nine months, and continued practically so during 1907. In 1908 development work was begun on the outcrops of a couple of seams much lower, stratigraphically, than those previously worked—tunnels being driven in from the level of the tipple and immediately behind it. These seams are dipping at a high angle and are very thick, the central portion being very dirty; the parallel entries were driven at the same level on the foot and hanging wall respectively.

After some considerable development had been done and coal mined, the coal was found to be very much fractured and too fine for locomotive use, and would not coke, so after two or three outbursts of gas, similar to those met with in the overlying seams, the work was again shut down.

The following is the record of production of the Carbonado Colliery since it was opened:

Year.	Gross Output.		Men Employed.		Total.
	Coal.	Coke.	Under-ground.	Above ground.	
1902	41,332		156	47	203
1903	138,750	625	231	75	306
1904	81,528	4,621	167	48	215
1905	96,934	7,826	166	54	220
1906	20,159				
1907	220		41	2	43
1908	23,279		66	29	95
1909	32,287		47	21	68

Michel Colliery.

Michel Colliery, also operated by the Crow's Nest Pass Coal Company, is situated on Michel creek, about four miles from its junction with the Elk river, and directly on the line of the Crow's Nest branch of the C. P. R., which follows up Michel creek to the Crow's Nest pass into Alberta, just over which summit, in Alberta, are situated the coal-mines of this age in that Province.

The Great Northern Railway has recently built from the United States boundary in Montana a line of railway up the Elk river, connecting at Morrissey and Fernie with the coal company's branch lines, and extending up Michel creek as far as Michel.

Michel creek, like Coal creek, flows into the Elk river from the east—the denudation of its valley cutting into and across the coal-measures, and so leaving on either side of the valley the exposed outcrops of the coal-seam, which are found dipping in a general easterly direction. The various coal-seams have been opened up by adit tunnels driven in from near the creek level, on their strike, the workings so far being chiefly to the rise of these tunnels, although not exclusively.

The mines now in operation are known as Nos. 3, 4, 5, 7, and 8. No. 7 Mine is opened up by a rock tunnel, crosscutting the measures driven from a point in the main east level of the No. 8 Mine, 2,000 feet from its mouth. The seam is 7 feet thick and is being developed by means of a pair of levels driven on the strike of the seam in both directions from the rock tunnel.

The plant is thoroughly equipped in every way with the best of machinery, housed in substantial brick buildings. During the past year the old wooden tipple, having served its usefulness, was replaced by a most modern steel tipple, 664 feet long and 14 feet wide, equipped with automatic dumps, shaking screens, picking belt, etc., operated by electricity and provided with ample storage-bins for slack coal, etc.

Mines 7 and 8 are ventilated by a steel fan (built by Walker & Sons, Wigan, England) 20 feet in diameter, and having a capacity of 200,000 cubic feet of air a minute against a 3-inch water-gauge.

The underground haulage is by compressed-air locomotives, supplied with air from a Canadian Rand compressor having a capacity of 1,300 cubic feet free air compressed to 1,200 pounds per square inch.

The following is the record of production of the Michel Collieries since they were opened up:—

Year.	Gross Output.		Men Employed.		Total.
	Coal.	Coke.	Underground.	Above ground.	
1900	9,966	.....	52	30	82
1901	.....	.....	.....	.....	.....
1902	113,853	29,347	158	62	220
1903	235,347	64,818	363	161	524
1904	235,256	95,685	372	102	474
1905	309,505	124,705	319	211	530
1906	273,497	96,214	400	228	628
1907	353,728	117,766	672	383	1,055
1908	412,185	131,776	729	348	1,077
1909	390,462	106,174	657	223	880

Hosmer Mines, Limited.

The Hosmer Mines, Limited, a company identified with the Canadian Pacific Railway Company, in 1908 opened up a new colliery at Hosmer, some six miles north of Fernie.

The coal-measures here outcrop high up on the hills to the east of the Elk river, and have been opened up by a crosscut tunnel started some 600 feet higher than the railway-track.

The property consists of six sections of coal lands, and two sections of surface, on which the town of Hosmer and the improvements connected with the plant are located. The seams, of which there are thirteen in number, varying from 4 feet to 30 feet, are being opened by

tunnels, driven at right angles to the measures, and starting at a point about 600 feet higher than the Canadian Pacific railroad-track at Hosmer station. Two tunnels are being driven parallel with one another, the larger tunnel consisting of three compartments, two of which are used for haulage purposes and the third as a travelling and pipe way; the parallel tunnel, consisting of one compartment, is used as a return air-course in connection with the ventilation of the mine. The tunnel is in at the present time 4,300 feet, and has cut nine of the seams, and ultimately will have to be driven in a distance of 5,400 feet to cut all the thirteen seams. These seams vary in dip from 65 degrees to 25 degrees. The tunnel was started in the 'Fernie shales' underlying the coal-measures, reaching the latter at a distance in of 847 feet, and the first seams cut are, therefore, the lower ones of the series. The quality of the coal is bituminous, rich in hydro-carbon, and, therefore, an excellent cooking-coal, as well as a steam-coal.

The ventilation of the mine is produced by a 20 x 9-foot Walker fan, running as an exhaust fan, but so fixed that, if necessary, it can be run as a blow-fan. This fan is driven by a pair of 16 x 30-inch engines, supplied with steam by three 80 horse-power boilers, and connected up to the fan with a rope drive. The fan is of steel with concrete setting, and the engine-house of brick. The other buildings at the mouth of the mine will be a concrete lamp-house and timekeeper's office, locomotive house for the compressed-air motors, and wash-house, with baths and lockers for the use of the miners.

The coal is lowered from the tunnel mouth to the level of the tipple by a steam-actuated double-track incline, each track being an independent incline. The mine cars, holding 2 tons of coal each, are lowered in trips of ten cars, and the empty cars are hoisted in convenient numbers. The haulage engines are a pair of 28 x 48-inch first-motion engines, with 8-foot drums, fitted with clutches and brakes, which, with the reversing gear and throttle, are all handled by steam, working through cataract cylinders.

From the foot of the incline the cars are hauled to the tipple by a compressed-air locomotive, and are dumped by a "cross-over tipple," the coal passing over shaking screens to remove the slack for use at the coke-ovens, and over picking-bands for the purpose of picking the refuse from the larger-size coal. The tipple is of steel construction on concrete foundations, the general design of which was that of the management, and the details and carrying-out of the same by the Roberts & Schaefer Co., of Chicago, Ill. Storage-bins are provided to hold 2,600 tons of coal, 200 tons of rock, and 3,000 tons of slack for the coke-ovens. The rock in the rock-bin is drawn out into iron self-dumping cars and hauled to the refuse-dump by a compressed-air locomotive. The coal in the coal-bins is loaded into box-cars by a "box-car loader," and into open cars from chutes. The slack for the coke-ovens is loaded into 7-ton larries, and is hauled by a compressed-air locomotive over the coke-ovens.

There are 240 "beehive" coke-ovens, 12 feet in diameter and 7 feet high, which will give an output of 300 tons of coke a day. "Belgium ovens," with a by-product recovery and distilling plant, are in contemplation for the next ovens required.

The power-house building, of re-enforced concrete, with steel floor-joists, and steel roof-trusses covered with corrugated iron, contains two low-pressure and two high-pressure compressors, the former to furnish air at 100 pounds for the rock-drills, inside hoisting engines, and various other purposes around the plant, the latter to furnish air at 1,000 pounds for the five compressed-air locomotives. Two 75 K. W. alternating current generators, for the purpose of lighting the town and plant, are driven by two 125 horse-power engines. All of these engines are fitted with cut-off valves, the purpose being to carry steam at 120 pounds pressure, cut off early, and use the steam expansively. The exhaust steam from all of these engines is connected into two 20-inch pipe-lines, one known as the "atmosphere line" and the

other as the "heater line." By means of valves, the steam from any, or all, the engines can be turned into either of these lines. When turned into the heater line, the steam passes through a 1,500 horse-power Hoppes exhaust steam heater, heating the boiler feed water to 200 degrees F. A 10-ton travelling crane has been installed for the convenient handling of the machinery.

A boiler-house, also of re-enforced concrete, with steel-trussed roof covered with corrugated iron, and a cement floor, contains four 250 horse-power Babcock & Wilcox boilers, with chain-grate stokers, and with appliances for the convenient handling of coal and ashes.

The town on the company's property at the present time consists of a general office, mess-house, three officers' residences, several foremen's houses, a large boarding-house, sixty miners' houses, and an hospital, all neatly painted, and supplied with water and electric light. Quite a large and progressive town has been built across the C. P. R. tracks, on property not owned by the company, where are located the stores, hotels, etc., necessary for the maintenance of a miners' camp.

The following is the record of production of the Hosmer Colliery since it was opened:—

Year.	Gross Output Coal.	Coke.	Men Employed.		
			Underground	Above.	Total.
1908 (1 month)	2,627	771	239	122	361
1909	60,324	21,575	256	145	401

Corbin Coal and Coke Company.

The Corbin Coal and Coke Company in 1908 opened up a new colliery on McGillivray creek, the south branch of Michel creek, near the summit of the Rocky mountains.

A branch line of railway leaves the Canadian Pacific Railway at McGillivray Station (the Loop) and follows up the South fork for about twelve miles to the colliery.

On the west side of the valley of the creek there have been found several outcroppings of coal-seams, the full significance of which has not, as yet, been demonstrated by the development work done, further than to prove that the deposit is quite extensive and consists of an excellent quality of bituminous coal.

In a general way the seams here exposed represent the eastern edge of the same basin, on the western edge of which are situated the collieries of the Crow's Nest Pass Coal Company and the Hosmer Mines, and consequently the general dip of these seams at Corbin should be to the west.

As far as could be determined by the present development, the main seam dips about 70 degrees to the east, and appears in the preliminary workings to be at least 40 feet wide.

There is, however, evidence of local flexuring and probably of folding of the seam, since crosscuts driven at right angles to the main tunnel, farther in, have demonstrated the thickness of the seam, at right angles to its bedding and strike, to be approximately 200 feet of nearly clear coal, while a little farther in, a heavy tongue of rock comes in, which has the appearance of being a portion of the enclosing rock caught in with the coal in some folding, the exact nature of which has not as yet been determined.

The coal-seam is found outcropping along the ridge of a low rounded hill rising a few hundred feet above the creek valley; at the end of this hill the outcrop extends down to the creek level.

On this end outcrop a main tunnel, 11 feet by 8½ feet, has been run in on the coal for about 1,000 feet, with various crosscuts to the walls, very much as would be done in metal-mining.

Some 70 feet higher than the main tunnel a smaller tunnel has been driven, and connecting these there are raises, which form an excellent natural ventilation sufficient for preliminary work, and no serious amount of gas has yet been encountered.

On the same end of the hill into which the tunnel has been run, but slightly to the westward and higher up the hill, a second outcrop has been uncovered, apparently dipping south; while, still a little farther to the west, a third outcropping of coal is known—dipping to the west—upon which an exploratory tunnel has been started.

Sufficient work has not yet been done to determine what relationship these outcrops have the one to the other, but the deposits form an interesting study, both from a geological and mining point of view, and promise to be quite extensive.

Considering the tremendous width as indicated by the present workings, if this width is maintained, it is quite possible the deposits may be worked on the "glory-hole" principle from the surface, as the surface covering is comparatively light.

The surface plant so far erected is of a temporary character, consisting of coal-storage bins, to which has been added a temporary screening appliance, no proper tipple having as yet been erected.

The coal, as mined, is very brittle and produces a large percentage of fines, but is of excellent quality for steam purposes and can be made into coke.

The average run of the assays of the coal of the entire mine is about as follows:—

Moisture	1 to 2	per cent.
Vol. comb. matter	20 " 22	"
Fixed carbon	64 " 67	"
Ash	9 " 12	"

Also *see* Analyses Nos. 33 and 34 in Schedule of Analyses herewith.

The coal mined has been practically all from development workings and has been sold chiefly in Spokane.

The following is the amount of coal produced by this colliery since it was opened up in 1908:—

Year.	Gross Output.		Men Employed.		Total.
	Coal.	Coke.	Below.	Above.	
1908	4,111		43	11	54
1909	60,824		119	39	158
Total	64,935				

Undeveloped Collieries.

In this Southern, or Crow's Nest, coal-area, besides these collieries mentioned as developed and actually producing, there are several locations which have been sufficiently prospected to prove that they contain seams of coal of such size and quality, and so conveniently located, as to offer sites for other collieries. Of these locations there may be mentioned—

South Side of Morrissey Creek.

On the opposite side of the creek from the workings of the Crow's Nest Pass Coal Company, there are a number of coal-seams which were seriously prospected by the Canadian Pacific Railway and might probably have been opened up, but, under the arrangement between the British Columbia Southern Railway Company and the Dominion Government, the latter had a right to the selection of some 5,000 acres of coal lands after the Crow's Nest Pass Coal Company had taken its quota, and this area south of Michel creek was one of the areas selected by the Dominion Government, and is now held by that Government.

Sparwood.

The escarpment forming the general eastern boundary of the Elk valley contains the outcrops of the coal-seams from Morrissey creek north to Michel creek, and these seams have been opened up at Coal creek and at Hosmer, as already noted.

Sparwood is about half-way between Hosmer and Michel creek mines, and the coal measures and seams are here outcropping high up on the hillside; these seams have been prospected, it is understood, very satisfactorily; the exact results have not been made public, but there is no doubt but that this ground contains the same seams seen at Hosmer and Michel, while their proximity to the valley of Elk river, with its two competing lines of railway, renders the area available at any time. This area is also held by the Dominion Government.

North Fork of Michel Creek.

On the North fork of Michel creek, some fifteen to twenty miles from its junction with the main creek, a number of coal-areas have been located, known as the McInnes locations, which have been prospected to a certain extent, demonstrating the existence there of a number of workable seams of coal.

This deposit lies in a comparatively small subsidiary valley, lying to the east of the main valley of the Elk river and between it and the summit of the Rocky mountains, and is probably unconnected with the main area.

South Fork of Michel Creek.

The Corbin Coal & Coke Company, operating on this creek and producing coal, has already been noted.

On the West fork of the South fork of Michel, in the vicinity of Marten creek, there outcrops the eastern edge of the main coal-basin, the western edge of which is being worked at Coal creek and Morrissey creek.

This was one of the points first discovered in the District, and is described by Dr. Selwyn in the "Report of the Geological Survey, 1891," p. 14A. According to this report the section here discloses some twenty coal-seams, aggregating in thickness 132 feet, of which fourteen seams, varying in thickness from 2 to 6 feet, and aggregating a thickness of 50 feet, are cannel coal; the remaining six seams, aggregating 82 feet, are bituminous.

The following analyses of these seams of cannel coal are given in the "Report of the Geological Survey, 1888-9," p. 7R—by fast coking:—

Hygro. moisture	2.10	per cent.
Vol. combust. matter	57.71	"
Fixed carbon	30.33	"
Ash	9.86	"
	100.00	"

The "Report of the Geological Survey, 1887-8," p. 12T, *et seq.*, contains analyses of the bituminous seams as follows:—

By Fast Coking.	Peter Seam, 15 ft. Thick.	Jubilee Seam, 30 ft. Thick.
Hygro. moisture	1.79%	1.89%
Vol. combust. matter	33.04	30.41
Fixed carbon	61.55	63.33
Ash	3.62	4.37
	100.00	100.00

A correlation of the seams of this District with those of the Morrissey section, ten miles distant and on the other edge of the basin, is given on page 78A of the "Report of the Geological Survey, 1901," which indicates that the seams are fairly persistent.

In the vicinity of Marten creek the Crow's Nest Pass Coal Company holds a considerable number of square miles of coal-areas which will eventually be opened up, as they are easily accessible by a railway running up the South fork of Michel creek.

Following up the east branch of the South fork from Corbin and over the low divide on to the watershed of the Flathead river, there are found a number of coal locations which have been opened up this past season by a Mr. Davis for English capitalists.

The work here done is as yet only of a prospecting character, but has demonstrated the existence of a number of workable seams.

Flathead Country.

Prospecting for coal in the Flathead country, South-east Kootenay, was carried on quite extensively during the summer of 1909.

At Camp Davis, situate on the Flathead river about fourteen miles from Corbin, the terminus of the Eastern British Columbia Railway, fifteen men were employed by Thomas Davis and his associates prospecting and developing the coal-seams opened on their properties during 1907 and 1908.

The work done during 1909 consisted chiefly in proving the continuity of the coal-seams by means of tunnels and incline shafts. There are four seams of bituminous coal on this property. No. 1 seam, 6 feet thick, has been opened by tunnels and incline shafts at six different points, one tunnel being run in on the coal for nearly 200 feet. Seam No. 2, 8 feet thick, has one tunnel run in on the coal for about 75 feet. Seam No. 3, 10 feet 3 inches thick, is the best seam on the property, the coal being exceptionally clean, with a high percentage of fixed carbon; one tunnel was run in on this seam for about 70 feet, at which point an incline shaft was sunk on the coal for 40 feet, where the coal is hard and firm; about 700 yards from this point an incline shaft was sunk on the same seam for a depth of 50 feet, showing the quality and thickness of the seam to be the same as in the original location. Seam No. 4, 16 feet thick, has been opened in several places with open cuts, and an incline run down on the coal for 50 feet, where the coal is hard and firm. The distance between each of the seams is about 300 feet; the coal-seams trend east by north, west by south, and pitch north at an angle of 40 degrees.

Dr. C. W. McDorman and the Flathead Coal Co., whose property adjoins the Davis properties on the east and west, employed six to eight men all summer opening their coal-seams

near the Flathead river, which are a continuation of the seams mentioned on the Davis properties.

About ten miles south of the Davis properties, D. A. Cato and his associates have been working two years prospecting several coal claims. During the autumn of 1909 they opened a fine seam of bituminous coal 8 feet thick, and were preparing to remain in their camp all winter to continue development work.

About ten miles north of the international boundary, on the west of the Flathead river, near Spruce creek, Mr. Dally opened a seam of good coal, which he is now developing with a force of ten men.

At the present time all supplies have to be packed into the Flathead from Corbin, which makes prospecting for coal very expensive, but with the building of the Flathead and South-east Kootenay railways in the near future, this expense will be greatly reduced.

The Northern, or Upper Elk River, Area.

The Northern area of the Rocky mountain coalfield commences about twenty-four miles north of Michel creek and extends northward to the headwaters of the Elk river, at Kananaskis pass, a distance of forty miles, embracing in its area most of the territory lying between the Elk river and the summit of the Rocky mountains, the interprovincial boundary, including the watershed of the northern portion of the Fording river.

The maximum width of the field is about seven miles, and, towards the north, it diminishes to a vanishing point at Kananaskis pass. The area of this coalfield has been computed at about 140 square miles, and the number of workable coal-seams there is large.*

While there is no doubt but that at the time of deposition the coal-deposits of the Southern and Northern areas were one and continuous, the upheaval of the Rocky mountains and subsequent denudation have removed a portion of the coal-bearing measures, and now between the two areas there is a distance of about twenty miles in which coal does not exist, and in which the underlying limestones are in evidence on the surface.

† The Cretaceous coal-bearing formation of this area occupies a depression between limestone ranges. On the east side of the area they rest conformably upon the limestones; on the west the limestones have been overthrust upon the sharply folded Cretaceous rocks.

Between the two limestone ranges lie the valleys of the Elk river and its tributary, the Fording river. Between the Elk and Fording rivers are two prominent topographical ridges, the Green hills, formed by the Cretaceous rocks.

"The general structure of the Green hills is that of a broad synclinal basin, the southern range of the Green hills forming one limb of the syncline and the northern range the opposite limb; the topographical depression between the ridges is a synclinal trough with its axis running in a north-west to south-east direction. West of the Elk river, near the southern boundary of the area, there is evidence of the existence of an anticlinal fold whose axis lies east of the river, the arch of which has been worn away. This anticline thus lies between the main synclinal basin and the overthrust limestone range on the west."

The coal-measures, so far developed, all lie to the east of the Elk river, with the exception of a relatively small area near the south end of the field which is probably on the anticlinal fold already mentioned, and which, as yet, has not assumed much importance.

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* Dowling's Report, 1909, Geological Survey of Canada, Bull. No. 1,035.

† From private Report by Prof. A. W. G. Wilson, McGill University, Montreal. Kindly loaned by Mr. W. H. Aldridge.

CORBIN COAL & COKE CO.'S COLLIERY AT CORBIN, EAST KOOTENAY.

UPPER ELK RIVER COALFIELD. Looking south from Aldridge Creek, showing C. P. R. locations.

It is possible, however, that in the upper reaches of the Elk river, near its source, coal may be developed to the west of the river for a short distance.

The base of the coal-bearing measures is well marked by a persistent massive sandstone which outcrops on both edges of the synclinal basin, and underlies several hundred feet of barren shales.

The rocks of the coal-measures are coarse and fine sandstones, massive clay shales, and thick bedded shales, on top of which is a band of conglomerate, which has, however, been eroded away in the southern Green hills range.

The total thickness of the coal-measures is approximately 1,800 feet.

The coalfield so far as known is held chiefly by companies or syndicates, viz.: The syndicate represented by Mr. W. H. Aldridge, and known locally as the Canadian Pacific Railway Syndicate; the Imperial Coal & Coke Company, and the Northern Coal & Coke Company.

Canadian Pacific Railway Syndicate.

The southern end of this coal-area is included in Lot 4,588, which belongs to the Canadian Pacific Railway, acquired through the British Columbia Southern Railway.

Immediately north of this lot and extending fourteen miles up the Elk river, the Canadian Pacific Railway Syndicate holds some forty-six square miles of coal-areas.

At the southern end of these areas the coal-outcrops on the Elk river slope of the Green hills range are found to be from 1,500 to 2,500 feet vertical higher than the river, but towards the northern end of this group of claims, at Aldridge creek, the coal-outcrops come down to the valley level.

On the southern tier of claims held by this syndicate, on Lot 3,422, prospecting work has exposed the outcroppings of some twenty-one seams of coal, dipping to the north-east at angles of about 35 degrees. These outcrops are at an altitude of about 7,000 feet, or 2,000 feet higher than the valley of the Elk river, and as they are, therefore, not as favourably located for present development as certain other claims held by the syndicate, they have been only roughly prospected, but sufficiently to prove the existence of the seams here and their general regularity.

About three miles farther north, on the C. H. Gill claim, Lot 6,047, Dr. Wilson has marked the outcrops of some eleven seams of coal, of which he gives the analyses of the coal from seven seams, including seams of thickness of from 8 to 20 feet. These seams are located at altitudes of from 6,000 to 6,500 feet, or from 900 to 1,500 feet above the level of the river at this point. These seams are also dipping to the north-east at angles of about 28 degrees, and doubtless further prospecting will reveal quite as many seams as on Lot 3,422, while various intermediate cuts vouch for their continuity between the two points. These exposures are seen on the hillside just above the company's cabin and storehouse—known locally as C. P. R. Headquarters—to which point there is a waggon-road from Michel, over which supplies are taken in by a two-horse team, the time occupied by the trip inward, loaded, being three days and the return trip, light, two days.

A mile farther north from Headquarters, on Lot 6,048, what are presumably the same seams have been exposed by a series of test-pits, showing the seams dipping to north-east.

The Green hills in all this distance have an average maximum altitude of about 7,000 feet, although the occasional peaks rise as high as 8,000 feet over a limited area, which would represent a maximum cover over the seams of about 2,000 to 3,000 feet.

Proceeding northward from Headquarters, outcroppings of coal are found on the hillside for ten miles; for the first five miles the dips are to the north-east, after which they are found

to be south-west, indicating that at the point of change the basin of the anticlinal fold is crossed, and that the coal found northward is a part of the eastern leg of the anticlinal basin previously referred to.

At Abbott creek, on Lot 6,823, about nine miles north of Headquarters, and at Aldridge creek, on Lot 6,825, a number of seams have been prospected and proved.

On the former creek Dr. Wilson shows some eight seams of coal as developed within a vertical height of 400 feet, that is between elevations of 5,800 and 6,200 feet, of which he gives analyses. These seams are found to strike north-west and south-east, with dips to south-west of from 43 to 62 degrees at the outcrops.

On Aldridge creek, on Lot 6,825, Dr. Wilson gives analyses from some seven seams, the outcrops of which are cut by the valley of the creek. (*See* Schedule of Analyses, samples Nos. 60 to 66.)

Aldridge creek is practically the northern boundary of the group of claims held by this syndicate, although it holds one claim, Lot 6,826, covering the river valley for a mile farther north.

The seams at Aldridge creek are, unquestionably, those most readily accessible and the ones that can be opened up and made productive with the least expenditure of money or time, and are, as far as can be judged by the present, the seams which promise the lowest mining costs; consequently, it is at this point that the development of late years has been chiefly done. Mr. Dowling, of the Geological Survey, in his report already quoted from, places the total thickness of coal at 163 feet, but does not mention the number of seams that go to make up this total thickness.

The management at Aldridge creek reports some twelve known seams as having been partly developed; the lowest four of these seams have been developed on the property of the Northern Coal Company (as on the Canadian Pacific Railway property they are probably covered), and in the flatter lands, and will eventually be reached by shafts.

The next five seams are those most readily available for immediate opening-up, and on these the syndicate has done the most serious development work.

The writer inspected these five seams this past summer, and found them to have a respective thickness of 14 feet 2 inches, 19 feet 9 inches, 9 feet, 3 feet 4 inches, and 10 feet. Analyses of coal from these seams will be found in the Schedule of Analyses accompanying this report, samples Nos. 35 to 38.

Above these five developed seams are three others having thicknesses of 10 feet, 15 feet, and 4 feet, respectively.

These five developed seams outcrop on the south bank of Aldridge creek from a quarter to half a mile above the flat benchland formed in the valley of the Elk river, and along this bench it is probable railway connection would be made.

The openings have all been made at, practically, the same elevation, just sufficiently high above the creek level to allow for suitable tipple height above a spur line of railway to be built up the creek from the river valley.

The following represents the conditions in which these five seams were found in August, 1909:—

No. 1 Tunnel.

No. 1 tunnel was driven in 153 feet on a seam of coal 14 feet 2 inches thick, in a S. 10° E. (astro.) direction, which represents the strike of the seam; the dip is 45 degrees to the west. The seam is free from serious shale partings, and was sampled by the writer completely across the face. The analysis is

given in Table of Analyses as No. 1. The pavement under the coal-seam is sandstone, while above the coal is 1 foot 2 inches of clod, or hard shale, and then a sandstone roof. The coal will make a good coke.

No. 2 Tunnel.

No. 2. tunnel was in 154 feet on a seam having the same strike, and a dip of 41 degrees to west. The seam has a sandstone pavement or foot-wall, on which lies 4 feet of good coal, then a shale parting of 9 inches in thickness, and then 14 feet of coal, above which there is 1 foot of clod, or shale, and then a sandstone roof. The 14 feet of coal was sampled at the face by the writer, and the analysis is given in Table of Analyses as No. 2.

No. 3 Tunnel.

No. 3 tunnel had been driven in 160 feet on the same strike, while above it, and separated by a 40-foot pillar, a counter level had been started away and was then in 35 feet. The seam has a dip to the west of about 70 degrees, and a sandstone pavement, or floor, above which is 3 feet of coal, then 2 feet of shale parting, and then 9 feet of coal, above which is a hard sandstone roof. The 9 feet of coal was sampled, and the analysis is given, No. 3 in Table of Analyses herewith.

No. 4 Tunnel.

No. 4 tunnel had been driven in for 93 feet in a S. 35° E. direction on the strike of the seam; the dip of the seam was 58 degrees, and to the west. The pavement was sandstone, above which was 7 feet of dirty coal—coal and shale mixed; this part of the seam is not good enough to mine. Above this was 4 feet 3 inches of unusually hard, firm coal; while above this coal was 1 foot 3 inches of clod, or hard shale, overlain by a sandstone roof.

No. 5 Tunnel.

No. 5 tunnel had been driven in 91 feet on the strike of a coal-seam which dips at an angle of 37 degrees to the westward. The pavement of the seam is sandstone, on which lies 10 feet of coal, with above it 1 foot 6 inches of hard shale and then a sandstone roof. The coal of this seam as seen at the face is particularly hard and clean; its analysis is given on an average sample across the face, as No. 4 in the Table of Analyses.

As already stated, the syndicate has at its headquarters camp substantial log buildings, to which point supplies are brought in by waggons.

From Headquarters to Aldridge creek camp there is only a pack-trail as yet, which, however, with a little work could be made into a good sleigh-road.

At Aldridge creek there has been erected a comfortable office for the local superintendent, a good log bunk-house and cook-house, a blacksmith-shop, having at one end a dry-room and wash-room for the miners; it is at this point that the most advanced preparations have been made for the actual opening-up of the seams.

From Headquarters a trail leads over the Green hills to their eastern slope in the valley of Fording river, where the syndicate had established a camp which, in August, 1909, was still under canvas, but two substantial log buildings were then approaching completion; a third had been begun, and all should have been completed before snow fell in the fall. These buildings will serve as office and superintendent's house, cook and bunk houses, and will be the headquarters for prospecting this part of the field.

The mining done here is entirely prospecting and of a nature only to demonstrate the field, and it is not expected that this location will be developed until after the Aldridge creek camp is fully opened up.

Several outcrops of coal have been located here, dipping to the south-west, and these are considered as marking the eastern outcrop of the synclinal fold, which has been more fully developed on its western outcropping in the Elk river valley.

The most northerly opening seen in this camp was near the northern part of Lot 6,647, the Jane L. Gill claim, where a tunnel had been driven for a distance of 55 feet, disclosing a seam of coal some 14 feet thick, having a strike of about S. 60° E. (mag.), and dipping to the south-west at an angle of about 45 degrees.

The seam promised well, but, as far as had then been developed, the coal was very soft, as it was near the weathered outcrop.

Table of Analyses of Coal from the Canadian Pacific Railway Syndicate's Elk River Seams. Sampled by Provincial Mineralogist. Analysed by Provincial Assayer.

No.	Sample Obtained from	Moisture.	Vol. Comb. M.	Fixed Carb	Ash.	Coking Qualities.
1	No. 1 seam, Aldridge Cr., C. P. R. Synd ..	1.1	23.3	69.0	6.6	Good.
2	No. 2 " " "	1.0	23.9	65.9	9.2	"
3	No. 3 " " "	0.9	22.4	64.4	12.3	"
4	No. 5 " " "	0.9	18.9	67.4	12.8	"
5	10-ft. seam, J. R. Wilson claim, Elk River Headquarters.....	0.9	17.9	73.7	7.5	Fair.

NORTHERN COAL AND COKE COMPANY.

In the Elk river valley, immediately adjoining on the north the lands held by the Canadian Pacific Railway Syndicate, there are a number of coal-areas held by the Northern Coal & Coke Company.

The development of these areas was in charge of Mr. F. Gardiner, but at the time the property was visited he was away temporarily, the work being left in charge of a foreman—McDonald—who was not very conversant with the affairs of the company, outside of the work he had in hand, which he was prosecuting with the aid of three men.

As far as could be learned, the holdings of this company began at the north bank of Aldridge creek, extending northward about eight miles, and are said to include some thirty-eight square miles of territory.

The men employed in the development were found at work on the fourth block above Aldridge creek, where they were engaged in driving a crosscut prospecting tunnel through sandstone, 5 feet by 7 feet, very lightly timbered. The barometric altitude of the tunnel mouth was 5,550 feet, or about the same as the Aldridge creek outcroppings. On August 9th this tunnel was in 84 feet in a N. 60° E. direction, and had not at that time struck coal—in fact, the coal for sharpening drills was packed on men's backs from Aldridge creek; it is since reported that coal was eventually struck. The hill to the east of the Elk river here is gently rolling, the measures all dipping to the west at an angle of about 44 degrees.

Some 200 yards to the south and 100 feet higher up than the tunnel, there is, in a small gulch, an outcropping seam of coal, on which no work has been done, but which has been stripped by the spring flow of water off the side-hill.

As best could be measured, this seam has from 20 to 25 feet thickness of coal, overlain by 2 feet of shale with a sandstone roof.

The outcrop was naturally soft, broken, and dirty, but a sample from the surface of the outcrop gave, upon analysis: Water, 8.6; vol. combustible matter, 20.5; fixed carbon, 54.7; and ash, 16.2. This sample was non-coking.

It was reported that on these properties tunnels had been driven in from Aldridge creek on seams of coal, but these tunnels had been allowed to cave in, and nothing could be seen in them.

While the development done on the property by this company is, as yet, of little importance, the work done by the Canadian Pacific Railway Syndicate on the south side of Aldridge creek, and the geological plans prepared, show that, beyond doubt, many of the coal-seams developed on the Canadian Pacific Railway property must continue under the areas held by the Northern Coal & Coke Company; there is no doubt but that they will eventually be found and proved on several of the areas immediately to the north of Aldridge creek, at no great depth, and so conveniently located as to be easily and cheaply opened up.

Imperial Coal Company.

The property held by this company comprises about ninety lots on the east side of Fording river and between that river and the British Columbia-Alberta boundary line. The company's holdings adjoin, on the south, the holdings of the Canadian Pacific Railway east of Fording river, and extend from Henretta creek southward for about twenty-six miles. The area included in these claims covers the Cretaceous strata lying to the westward of the limestone ranges of the Rocky mountains and nearly down to the valley of Fording river within the distance mentioned. Several large streams flowing from the mountains westward into Fording river have cut deep and, in some cases, wide flat-bottomed valleys across the coal-measures, by which valleys access to the coal-seams so cut can readily be had. Each creek valley might, therefore, be said to develop a separate coalfield for mining purposes, some eight in number, which might appropriately be designated by the creek through the valley of which they are accessible. These are Henretta creek, Clode creek, Lewis creek, Smith creek, Ewin creek, Grace creek, Line creek, and Grave creek.

Henretta Creek Field.

Henretta creek has a wide valley and rises very gradually from the river valley so that it could serve for railway lines to the various coal-outcrops. The Imperial Co. holds two areas and a half near the mouth of the creek, Lots 6,711, 6,709, and Fract. 6,719. On these the measures are found dipping to the south-west, at a very low angle on the western portion of the claims, but at an angle of about 45 degrees on the eastern border.

Clode Creek Field.

Clode creek is very narrow and steep, and it is probable that it would not be used as a starting point for workings through which coal would be extracted, as these seams could better be worked by drifting along them from Henretta creek on the north, or Lewis creek on the south.

Lewis Creek Field.

The valley of Lewis creek is flat-bottomed and would give access by railway on very easy grade the seams outcropping in the hills on either side of the valley. Eagle mountain, which forms the north side of the valley of this creek, has a synclinal structure; on the west the seams dip to north-east at an angle of 20 degrees, on the east they dip 40 degrees to the south-west, while in the middle, two miles east of Fording river, the seams are for some distance nearly horizontal. Some eight seams of good coal are reported as developed, one of which is 31 feet thick and of very good quality. In Castle mountain, which forms the southern side of the valley, the formation is the same as in Eagle mountain. It would appear that the best point to attack the seams in either mountain would be along the axis of this syncline.

Smith Creek Field.

This creek gives access to the seams on the south end of Castle mountain and in the north end of Grouse mountain, although it is probable that these seams could be reached, respectively, from Lewis creek on the north and Ewin creek on the south, by drifting on the seams, along their strike, although this would entail a maximum length of underground haulage of about four miles.

Ewin Creek Field.

Ewin creek has a broad flat valley rising by an easy grade from the river valley and offers excellent ground and space for a large colliery. This is, probably, the most available point for opening up the seams in this company's properties, and here the most active developments have been carried on. The company has erected here a substantial headquarters camp consisting of an office, storehouse, cook-house, and dining-room, with a couple of good large bunk-houses, divided into various rooms, all built of logs, etc.

In Grouse mountain, to the north, accessible from this creek, six good seams of coal are partly developed, dipping to the west at angles of about 45 degrees, which can all be mined by drifting in on the seams on their strike.

On Bear mountain, lying to the south of the creek valley, some nine seams of good coal have been proven—the details of which are given later; these seams dip to the west at angles of approximately 40 degrees and can all be mined by drifting in on the seams along their strike. The development work noticed in August, 1909, consisted of a series of tunnels, driven in from a contour level which would permit of a belt line of railway conveying the coal to a common tipple.

The following seams were examined and measured, commencing at the exposure farthest up the creek, the lowest seam, and proceeding westward:—

Seam A.—Tunnel in 150 feet. Altitude 5,625 feet. Seam consists of 10 feet of coal, then a parting of clay for a few inches, above which is 2 to 3 feet of coal and a shale roof. The coal is bright and clear and cokes well, but the seam is rather "dirty" from shale partings.

Seam B.—About 200 feet north of seam A, at an altitude of 5,550 feet. Tunnel in about 100 feet. It is caved so that the thickness of the seam could not be obtained. The coal on the dump is good and cokes well.

Seam C.—Is about 300 yards to the north-west of seam B; altitude, 5,525 feet. The tunnel is in about 150 feet, but was caved at the face. The seam dips to the west and is at least 6 feet thick. The coal evidently cokes well in an open fire.

Seam D.—This seam is about 150 feet north-west of seam C, and is about 3½ feet thick, of good coal. A tunnel had only been started and was just "faced up." No sample was taken for analysis.

Seam E.—This seam shows about 4 to 5 feet of clear coal, below which is 3 feet of dirty coal and above is 1 foot of dirty coal with a shale roof. The dip of the seam is 35 degrees to the west.

Seam F.—This seam is horizontally about 250 feet north-west of seam E, and on it a tunnel has been driven in for 220 feet. The seam dips at an angle of about 35 degrees to the west, and shows about 6 feet of clean coal, above which is from 2 to 3 feet of loose shaly coal.

Seam G.—Is 165 feet west of seam F, and, on its strike, a tunnel was in 240 feet, showing the seam to dip at 35 degrees to the westward, with from 5 to 6 feet of good coal with a band of 2 feet of shaly coal.

Seam H.—Lies about 150 feet west of G and is indicated, but not developed.

Seam I.—Lies 420 feet west of G and near the edge of the property. The tunnel on this, at an altitude of 5,600 feet, is in about 65 feet, showing the seam to dip to westward; there is on the bottom 8 feet of good coal, above which lies 6 inches of sandstone parting, then 2 feet of coal, above which is shale.

Analyses of Samples Taken by the Provincial Mineralogist, Imperial Coal Co.'s Seams.

	Water.	Vol. C.M.	Fixed Carb.	Ash.	Coking Qualities.
Seam A	1.4	19.1	70.1	8.1	Good.
Seam B	0.9	21.6	69.5	8.0	"
Seam C	2.8	22.8	69.4	5.0	"
Seam E	4.4	22.2	62.5	10.9	Non-coking.
Seam F	1.4	23.1	64.2	11.3	Good.
Seam G	1.3	24.7	62.8	11.2	"

Possible Railway Development.

The Canadian Pacific Railway and the Great Northern Railway both have substantial railway lines constructed as far up the Elk river as Michel prairie, at the mouth of Michel creek. From this point north the configuration of the country demands that a main line must follow up the Elk river valley, and there is no difficulty in so doing—in fact, a line has been surveyed as far north as Aldridge creek, a distance of forty-eight miles; it has been found that a road may be constructed to this point on a 1-per-cent. grade, and, as it follows the river valley, the work would be very light and inexpensive. As the coal-measures all lie to the east of the Elk river valley, short spurs, of a mile or so, would have to be run in from the main line to the points at which it may be decided to open up the coal. From Aldridge creek the railway might be continued northward, up the Elk river to its headwaters, and, crossing the summit, follow the Kananaskis river down so as to make a junction with the Canadian Pacific main line, near Kananaskis station.

A railway to reach the coal-areas on Fording river would not be quite so simple, since the lower portion of the Fording river, a few miles above its junction with the Elk river, is in a canyon, and very rapid, the fall being too great to permit of its being followed by a railway grade. Above this canyon, the Fording river valley can be traversed anywhere by a grade of less than 1 per cent., so that when this upper valley is once reached the problem is practically settled. To reach this valley of the upper Fording river, a branch line has been surveyed, and found quite practicable, leaving the main line in the Elk valley near Elk prairie, circling eastward on to the Green hills, and southward round the southern end of these hills into the Fording valley. The work on this branch, until the valley of the upper Fording is reached, would be heavy and expensive, but on an easy grade. From this main line and branch lines, spurs from one to four miles long, with workable grades, can be put into any of the coal-exposures.

CLASSIFICATION OF COAL.

In Western Canada there is a great variety in the quality of the coals found, varying from a poor lignite, that goes to powder on exposure to the air, to a coal that approaches the Eastern anthracite, and great difficulty has been found in arriving at a classification which would properly cover such a wide range of fuels.

The United States Geological Survey has recently made most extensive experimental investigations as to fuels, and has adopted a scale of classification, probably the most perfect known, based upon the relation between the total carbon and the total hydrogen in a coal; but this classification necessitates an ultimate analysis of each sample, a matter that can only be attempted in a very well-equipped laboratory, and but few records are available upon which to base a classification.

In a paper read before the Canadian Mining Institute, in March, 1908, Mr. D. B. Dowling, of the Geological Survey of Canada, suggested a scale of classification, which approximates the same relative scale, and is based upon the proximate analysis of a coal, by fast coking, on an air-dried sample, and combining both the fuel ratio and the moisture contents, and which he called the "Split Volatile Ratio."

$$\text{Split Volatile Ratio} = \frac{\text{Fixed Carbon} + \frac{1}{2}\ \text{Vol. Combustible.}}{\text{Moisture} + \frac{1}{2}\ \text{Vol. Combustible.}}$$

The resultant numerical value for the ratio as above indicated, if applied to the following scale, gives the class to which the coal belongs:—

Dowling's Scale of Split Volatile Ratio.

Anthracite	15 up.	Bituminous	3.5 to 6
Semi-anthracite	13 to 15	Low-carbon bituminous	3 to 3.5
Anthracitic coal	10 to 13	Lignitic coal	2.5 to 3
High-carbon bituminous	6 to 10	Lignite	1 to 2.5

This ratio has been adopted in the Canadian Geological Survey Bulletin, "The Coalfields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia," and, as it appears to be the classification best suited to our present requirements, it has been adopted in this Report, and serves to give a standard definition to the many terms in use in describing coals.

In the accompanying Schedule of Analyses, the source of the analysis is designated by a reference letter, and these references are given in the following table:—

Reference Letter.	Authority for Analysis.
A	Minister of Mines Report, 1902, p. 262; sampled by Inspector.
B	Geol. Survey Report, Vol. XVI.
C	Chief Engineer, Crow's Nest Pass Coal Co.
D	E. J. Roberts, Gen. Manager, Corbin Coal and Coke Co.
E	B. C. Bureau of Mines.
F	Report by Dr. A. W. G. Wilson, McGill University, to C. P. Ry. Syndicate, in 1905.
G	Can. Geol. Survey; Dowling's "Coalfields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia."
H	Prof. Milnor Roberts, Washington Univ.; private letter.
I	Paper by Castleman, Can. Mining Inst.; analysis by Hersey, of Montreal.
J	Analysis by Bryant & Co., Vancouver.
K	B. C. Minister of Mines Report, 1901, p. 1176.
L	Geological Survey Summary, 1907, W. W. Leach.
M	B. C. Minister of Mines Report, 1905, pp. 119 and 121.
N	Unpublished Analyses, B. C. Bureau of Mines.
O	B. C. Minister of Mines Report, 1904.
P	Analysis by J. O'Sullivan, Vancouver.

EWIN CREEK, FORDING RIVER, EAST KOOTENAY.
Showing location Imperial Coal & Coke Co.

MICHEL COLLIERY, EAST KOOTENAY. Showing new Tipple.

SCHEDULE OF ANALYSES OF BRITISH COLUMBIA COALS,

With Classification according to Dowling's "Split Volatile Ratio."

Designation No.	Locality.	Seam.	Authority or Reference.	Prox. Analy. by Fast Coking. Moist.	V. C. M.	F. C.	Ash.	Sulphur.	Coking Quality.	British Thermal Units.	Expanded Analysis Calc. on Clear Coal. Moist.	V. C. M.	F. C.	Split Vol. Ratio.	Classification by Split Vol. Ratio.	Remarks.
	Crow's Nest Pass Coalfield.															
1	No. 1 mine, Morrissey (Carbonado)	18 ft. thick	A	.90	22.19	70.09	5.6	.32		14,346	0.97	23.60	75.43	6.8	High carbon bit.	Highest seam worked, dip 21° N.
2	" 4 mine, Morrissey (Carbonado)	18 ft.	"	.82	11.73	71.50	15.75	.20		12,858	0.98	13.96	85.06	11.5	Anthracitic coal	
3	" 1 mine, Coal Creek	8 "	"	.84	23.59	67.41	7.85	.32		14,036	0.91	25.69	73.40	6.3	High carbon bit.	
4	" 1 " " "	9 "	"	.92	18.85	64.42	15.65	.16		13,757	1.10	22.40	76.50	7.1	" " "	
5	" 2 " " "	6 "	"	.84	22.38	73.17	3.15	.46		14,935	0.88	23.21	75.91	7.0	"	Dip 15° to E.
6	" 3 " " "		"	.92	20.63	72.05	6.00	.40		14,284	0.98	22.01	76.98	7.3	High carbon bit.	
7	" 4 " " "	22 "	"	.96	13.46	61.92	23.50	.16		12,114	1.26	17.63	81.11	8.9	" " "	
8	" 3 Michel	15 to 30 ft. thick	"	1.00	20.57	72.00	6.15	.28		14,656	1.07	21.99	76.94	7.3	" " "	Highest seam worked.
9	" 4 " 80 ft. below 3	10 to 30 " "	"	1.00	18.93	70.13	9.50	.44	Good	13,850	1.10	21.00	77.90	7.6	" " "	
10	Marten Creek, Jubilee seam	30 ft. thick	B	1.89	30.41	63.33	4.37			14,447	1.98	31.80	66.22	4.6	Bituminous	
11	" " Peter "		"	1.79	33.04	61.55	3.02			14,490	1.86	34.28	63.86	4.3	"	
12	" " Cannel "		"	2.10	57.71	30.33	9.86				2.34	64.00	33.66	1.9	Cannel coal	
13	No. 1 mine, Coal Creek	9 ft. to 12 ft. thick	C	1.19	26.54	65.63	6.64				1.27	28.43	70.30	5.4	Bituminous	Av. of 11 samples from N. levels off slope.
14	" 1 " " "	" " "	"	1.37	25.95	61.66	11.02				1.54	29.17	69.29	5.2	"	Av. of 9 samples from N. levels off incline.
15	" 1 " " "	" " "	"	1.37	27.22	63.02	8.39				1.50	29.71	68.79	5.1	"	Av. of 11 samples from S. levels off incline.
16	" 2 " " "	6 ft. thick	"	1.00	21.85	73.30	3.85				1.05	22.72	76.23	7.0	High carbon bit.	No. 3 West entry deeps.
17	" 2 " " "	5 ft. and 6 ft.	"	1.00	24.30	69.70	5.00				1.05	25.58	73.37	6.3	" " "	Av. 13 samples, No. 2 & 3 W. ent.
18	" 5 " " "	5 " " 10 "	"	0.96	24.09	63.19	11.76				1.09	27.30	71.61	5.8	Bituminous	Av. 13 samples.
19	" 5 " " "	5 "	"	0.98	21.94	64.40	12.68				1.12	25.12	73.76	6.3	High carbon bit.	Av. 31 samples. Av. of mine.
20	" 9 " " "	5 " to 5½ ft.	"	1.25	24.60	69.45	4.70				1.31	25.81	72.88	6.0	" " "	Av. 18 samples, Long-wall face.
21	" 9 " " "	4 " " 6 ft.	"	0.75	25.65	69.30	4.21				0.78	26.78	72.44	6.0	" " "	Av. 11 samples from main levels.
22	" 5 " Michel	5 " 6 in.	"	1.20	19.55	67.75	11.50				1.35	22.10	76.55	7.1	" " "	Room 2 off 1 E. level, 1 E. incline.
23	" 5 " "	5 " 6 "	"	1.10	20.50	71.10	7.30				1.20	22.10	76.70	7.2	" " "	" " " 2 W. " 1 W. "
24	" 3 " "	5 " 6 " to 7 ft.	"	1.01	20.95	69.00	9.04				1.12	23.04	75.84	6.9	" " "	Av. 8 samples, Rise workings.
25	" 8 " "	12 "	"	1.85	23.15	69.30	5.70				1.96	24.55	73.49	6.0	" " "	R. 6, E. level, No. 3 incline.
26	" 8 " "	10 "	"	1.85	22.95	70.60	4.60				1.94	24.06	74.00	6.1	" " "	R. 10, " " " "
27	" 8 " "	12 "	"	1.00	22.85	69.55	6.60				1.08	24.46	74.46	6.5	" " "	R. 6, " " " "
28	" 8 " "	12 "	"	1.50	22.10	66.50	9.90				1.67	24.52	73.81	6.1	" " "	R. 6, W. level, " "
29	" 8 " "	10 "	"	1.10	25.70	65.85	7.35				1.19	27.73	71.08	5.6	Bituminous	R. 34, No. 2 E. level.
30	" 8 " "	20 "	"	0.80	23.50	66.90	8.80				.87	25.77	73.36	6.2	High carbon bit.	R. 52, " " "
31	" 8 " "	30 "	"	0.92	23.50	67.46	8.12				1.00	25.57	73.43	6.2	" " "	R. 49, " " "
32	" 8 " "		"	1.62	23.67	67.79	6.92				1.74	25.43	72.83	5.9	Bituminous	Av. 23 samples, 3 E. and 3 W. main incline.
33	Corbin Coal & Coke Co., Corbin	Special 10 ft. band	D	1.50	13.50	79.00	6.00				1.60	14.36	84.04	10.4	Anthracitic coal	
34	" " " "	Average run of coal	"	2.00	22.00	66.00	10.00				2.22	24.45	73.33	5.9	Bituminous	
	Upper Elk River Field.															
35	Aldridge Creek, C. P. R. Synd., Lot No. 6825	No. 1, 14 ft	E	1.10	23.30	69.00	6.60		Good.		1.18	24.95	73.87	6.3	High carbon bit.	Sampled by Prov. Min., 1909.
36	Aldridge Creek, C. P. R. Synd., Lot No. 6825	" 2, " "	"	1.00	23.90	65.90	9.20		"		1.10	26.32	72.58	6.0	" " "	" " " "

SCHEDULE OF ANALYSES OF BRITISH COLUMBIA COAL.—*Continued.*

Designation No.	Locality.	Seam.	Authority or Reference.	Prox. Analy. by Fast Coking. Moist.	V. C. M.	F. C.	Ash.	Sulphur.	Coking Quality.	British Thermal Units.	Expanded Analysis Calc. on Clear Coal. Moist.	V. C. M.	F. C.	Split Vol. Ratio.	Classification by Split Vol. Ratio.	Remarks.
	UPPER ELK RIVER FIELD.—*Concluded.*															
37	Aldridge Creek, C. P. R. Synd., Lot No. 6825	No. 3, 9 ft.	E	.90	22.40	64.40	12.30		Good		1.02	25.55	73.43	6.2	High carbon bit.	Sampled by Prov. Min., 1909.
38	Aldridge Creek, C. P. R. Synd., Lot No. 6825	" 5,10 "	"	.90	18.90	67.40	12.80		"		1.03	21.67	77.30	7.4	" " "	" " " "
39	Headquarters Camp, Elk river, Lot No. 6047		"	.90	17.90	73.70	7.50		Fair		.97	19.35	79.68	8.3	" " "	" " " "
40	Northern Coal Co., Elk river	Outcrop	"	8.60	20.50	54.70	16.20		Poor		10.26	24.46	65.28	3.4	Low carbon bit.	" " " "
41	Imp. C. & C. Co., Fording river	A	"	1.40	19.10	71.40	8.10		Good		1.52	20.78	77.70	7.4	High " "	" " " "
42	" " " "	B	"	.90	21.60	69.50	8.00		"		.97	23.48	75.55	6.9	" " "	" " " "
43	" " " "	C	"	2.80	22.80	69.40	5.00		Poor		2.95	24.00	73.05	4.0	Bituminous.	" " " "
44	" " " "	E	"	1.40	22.20	62.50	10.90		Good		4.94	24.91	70.15	4.7	"	" " " "
45	" " " "	F	"	1.40	23.10	64.20	11.30		"		1.57	26.05	72.38	5.8	"	" " " "
46	" " " "	G	"	1.30	24.70	62.80	11.20		"		1.46	27.82	70.72	5.5	"	" " " "
47	" " " "	I	"	.70	14.70	55.40	29.20		Fair		.98	20.77	78.25	7.8	High carbon bit.	" " " "
48	Elk riv., C. P. R. Syn., Lot. 6980	Surface outcrop	F	8.20	30.30	58.50	3.00		Non		8.47	31.23	60.30	3.1	Low " "	From Prospect workings.
49	" " " " 6047	" "	"	8.00	25.90	61.80	4.30		"		8.36	27.06	64.58	3.5	Bituminous	" " "
50	" " " " "	" "	"	5.40	29.90	58.70	6.00		"		5.74	31.81	62.44	3.6	"	" " "
51	" " " " "	" "	"	5.40	29.30	62.40	2.90		"		5.56	30.17	64.27	3.8	"	" " "
52	" " " " "	" "	"	11.00	26.50	58.00	4.50		"		11.51	27.74	60.74	2.9	Lignitic coal?	Analysis doubtful.
53	" " " " "	Deep cut	"	1.00	24.20	67.40	7.40		C'k'ng		1.08	26.13	72.79	6.0	High carbon bit.	
54	" " " " "	" "	"	0.80	19.70	59.20	20.30		"		1.03	24.71	74.26	6.4	" " "	
55	" " " " "	" "	"	0.70	20.50	56.20	22.60		"		.91	26.48	72.61	6.0	" " "	
56	" " " " 6822	Shallow cut	"	2.00	18.80	69.60	9.60		Non		2.21	20.79	77.00	6.9	" " "	
57	" " " " 6823	" "	"	1.5	19.50	73.40	5.60		Poor		1.59	20.65	77.76	7.4	" " "	
58	" " " " 6824	" "	"	0.7	28.30	69.10	1.90		"		.71	28.86	70.43	5.6	Bituminous.	
59	" " " " 6823	" "	"	0.8	26.70	63.30	9.20		"		.88	29.41	69.71	5.4	"	
60	" " " " 6825	" "	"	3.4	29.10	52.60	14.90		C'k'ng		4.00	34.19	61.81	3.7	"	
61	" " " " 6825	" "	"	4.7	29.60	60.40	5.30		Slig'ly		4.97	31.25	63.78	3.8	"	
62	" " " " 6825	" "	"	3.8	15.20	77.90	3.10		"		3.92	15.69	80.39	7.4	High carbon bit.	
63	" " " " 6825	" "	"	19.6	19.00	50.10	11.30		Non		22.09	21.43	56.48	2.0	Lignite.	
64	" " " " 6825	Surface	"	8.2	23.90	49.80	18.10		"		10.02	29.18	60.80	3.0	Low carbon bit.	
65	" " " " 6825	Shallow cut	"	6.0	26.90	63.30	3.80		"		6.23	27.96	65.81	3.9	Bituminous.	
66	" " " " 6825	" "	"	0.6	32.10	64.80	2.50		C'k'ng		.61	32.92	66.47	4.8	"	
67	" " " " 6823	" "	"	0.7	24.60	55.20	19.50		"		.87	30.55	68.58	5.2	"	
68	" " " " 6824	" "	"	0.8	26.30	65.10	7.80		"		.86	28.53	70.61	5.6	"	
69	" " " " 6822	" "	"	6.2	18.20	63.90	11.70		Non		7.02	20.62	72.36	4.7	"	
70	" " " " 6823	" "	"	1.2	20.00	55.70	23.10		C'k'ng		1.56	26.00	72.44	5.8	"	
71	" " " " 6823	" "	"	1.5	19.80	60.40	18.30		"		1.83	24.24	73.93	6.1	High carbon bit.	
72	" " " " 6646	Surface	"	6.5	21.70	61.00	10.80		Non		7.29	24.33	68.38	4.1	Bituminous.	
73	" " " " 6646	"	"	6.8	23.00	57.10	13.10		"		7.83	26.46	65.71	3.7	"	
74	" " " " 6646	"	"	7.3	23.30	64.30	5.10		"		7.69	24.56	67.75	4.0	"	
75	" " " " 6645	"	"	3.0	17.30	61.70	18.00		Slight		3.66	21.10	75.24	6.0	High carbon bit.	
76	" " " " 6644	"	"	10.5	19.80	57.50	12.20		Non		11.95	22.56	65.49	3.3	Low carbon bit.	
77	" " " " 6635	"	"	13.4	27.40	51.90	7.30		"		14.45	29.56	55.99	2.4	Lignite.	
78	" " " " 6635	"	"	20.3	15.10	44.10	20.50		"		25.53	19.00	55.47	1.8	"	
79	" " " " 6647	"	"	12.8	30.90	30.50	19.80		"		15.96	38.52	45.52	1.8	"	

	COAST DISTRICT.															
80	Comox, Union Colliery	Upper seam	G	1.34	30.01	65.82	2.83				1.39	30.88	67.73	4.9	Bituminous.	
81	" " "	Lower seam	"	1.70	32.36	63.08	2.86				1.75	33.31	64.94	4.4	"	
82	" Baynes sd. mine	Richardson seam	"	1.18	34.13	48.51	16.18				1.41	40.72	57.87	3.6	"	
83	Vancouver Id. No. 5 pit, Comox	Upper seam	A	1.08	29.24	57.03	9.60	3.05			1.23	33.48	65.29	4.6	"	
84	" Comox, Hamilton lake		"	1.70	22.82	47.72	27.00	0.76		10,626	2.36	31.58	66.06	4.5	"	
85	No. 4 slope	Comox or low. seam	"	.88	27.34	61.82	8.76	1.26		13,881	.98	30.36	68.66	5.2	"	
86	" 5 pit	" " "	"	1.32	27.62	63.64	6.70	0.72		14,191	1.42	29.84	68.74	5.1	"	
87	" 6 "	" " "	"	1.20	27.33	63.49	6.80	1.12		14,191	1.36	29.68	68.96	5.1	"	
88	" 1 shaft, Esplan., Nanaimo	Up sc., dip 1 in 10 E.	"	1.88	33.27	54.67	9.40	0.78		12,672	2.10	37.04	60.86	3.8	"	
89	" " " "	Lo. seam, 1 in 10 E.	"	2.86	35.84	54.79	5.50	1.01		12,951	3.06	38.33	58.61	3.5	"	
90	Harewood mine; dip 1 in 10 E.		"	1.58	33.84	52.17	11.85	0.56		12,238	1.80	38.64	59.56	3.7	"	
91	No. 5 Southfield mine		"	2.08	35.78	56.26	5.60	0.28		13,261	2.21	38.02	59.77	3.7	"	
92	Bottom vein, 15 to 20 ft. S. 20° W.	Extension seam	"	1.28	35.26	55.83	7.30	0.33		13,199	1.38	38.17	60.45	3.8	"	
93	Top vein " " "	" "	"	1.24	36.49	53.72	8.20	0.35		13,261	1.35	39.90	58.75	3.7	"	
94	Bottom seam, Tunnel vein (Report, 1902)	S. 12° W. dip 10°.	"	1.52	35.27	57.04	5.85	0.32		13,416	1.62	37.58	60.80	3.9	"	
95	Top seam, Tunnel vein (Report, 1902)	" "	"	1.44	31.40	46.18	20.65	0.33		11,401	1.82	39.74	58.44	3.6	"	
96	Nanaimo, Wellington mine		G	2.75	38.03	52.64	6.58			12,567	2.95	40.70	56.31	3.3	Low carbon bit.	
97	" New Vanc. C. Co.	Commercial coal	"	2.06	34.07	56.94	6.67	0.25			2.21	36.61	61.18	3.8	Bituminous.	
98	" No. 5 Southfield		A	2.08	35.78	56.26	5.60	0.28		13,261	2.21	38.02	59.77	3.7	"	
99	" Wellington mine	Commercial samp.	G	8.57	25.30	50.40	9.52	0.21			9.50	28.02	62.48	3.2	Low carbon bit.	
100	Nicola, Middlesboro Colliery	Coal Gully	"	3.04	37.18	52.05	7.73		Good		3.29	40.30	56.41	3.2	" "	
101	" Lot 1267	Quilchena creek	"	6.95	37.21	47.95	7.89		"		7.54	40.40	52.06	2.6	Lignitic coal.	
102	"	Coldwater	"	3.17	35.73	55.25	5.85		"		3.36	37.96	58.68	3.4	Low carbon bit.	
103	" Coldwater	6 ft. seam	"	2.13	27.99	59.66	10.22		"		2.37	31.18	66.45	4.5	Bituminous.	
104	"	Coal Gully	"	3.35	26.55	59.30	10.80		"		3.76	29.76	66.48	4.3	"	
105	" Coal Hill Synd.	Av. of 3 seams	H	5.58	37.81	50.77	5.84				5.92	40.13	53.92	2.8	Lignitic coal.	Av. of 5 analyses.
106	" Diamond Vale C. & L.	Lump	"	2.66	37.84	55.14	4.36				2.78	39.57	57.65	3.4	Low carbon bit.	
107	Nicola Val. C. & C. Co., Nicola	No. 1	"	4.69	36.89	51.06	7.36				5.06	39.82	55.12	3.0	" "	
108	" " " " "	" 5	"	3.44	38.86	49.24	8.46				3.76	42.45	53.79	3.0	" "	
109	" Middlesboro Colliery		I	2.67	37.10	52.27	7.96	0.77			2.90	40.30	56.80	3.34	" "	
110	Vermilion Forks M. C., Princeton Colliery	By B. of M.	E	10.40	31.70	45.10	6.80				17.60	34.00	48.40	1.89	Lignite.	
111	Vermilion Forks M. C., Princeton Colliery		J	10.45	36.77	45.60	6.42	0.76			11.25	39.62	49.13	2.21	Lignitic coal.	
112	Vermilion Forks M. C., Princeton Colliery	Av. of seam by P.M.	K	11.97	30.49	49.21	8.33				13.06	33.26	53.68	2.4	" "	
	NORTHERN INTERIOR.															
113	Telkwa river	5 ft. 6 in	L	1.36	10.87	80.82	6.95				1.46	11.68	86.86	12.7	Anthracitic coal.	
114	" "	7 " 3 "	"	0.80	11.10	78.90	9.20				.88	12.22	86.90	13.3	Semi-anthracite.	
115	" "	4 " 0 "	"	.60	10.80	82.70	5.90				.64	11.48	87.88	14.6	" "	
116	" Goat cr., Cassiar C. C.	14 ft.	M	6.60	29.00	56.90	7.50				7.13	31.36	61.51	3.4	Low carbon bit.	
117	" " Transcontinental Dev. Synd.	28 in.	"	.80	8.20	81.60	9.40				.88	9.06	90.06	17.5	Anthracite.	
118	Morice river, Bulkley valley		N	2.70	22.90	68.80	5.60		Non		2.86	24.26	72.88	5.6	Bituminous.	
119	Fraser river, near Quesnel		"	14.60	37.30	43.40	4.70		"		15.32	39.14	45.54	1.8	Lignite.	
120	" " 30 m. below Ques.		"	27.90	28.60	34.50	9.00		"		30.65	31.43	37.92	1.1	"	
121	Queen Char. Ids., Camp Wilson	No. 1 surface	O	1.23	17.22	61.96	19.49				1.66	21.38	76.96	7.1	High carbon bit.	
122	" " " " "	" 3 "	"	2.01	9.13	86.06	2.80				2.07	9.39	88.54	13.7	Semi-anthracite.	
123	Tumbo Island		P	1.5	41.00	50.50	6.00	1.00			1.60	44.00	54.30	3.2	Low carbon bit.	

EXTENSION EXPLOSION.

On October 5th, between 8:30 and 9 A.M., an explosion took place in No. 2 West mine of the Extension Colliery of the Wellington Colliery Company, whereby thirty-two men were killed. The Chief Inspector and District Inspector at once proceeded to the mine and assisted in the exploration of the district affected and the recovery of the bodies.

Subsequently the Hon. the Minister of Mines directed that the Chief Inspector and the Provincial Mineralogist make a special examination of the mine and separate reports as to the cause of the accident.

At the request of the Chief Inspector, the Minister also engaged Mr. James Ashworth, an English mining engineer, to make a similar examination and report; these examinations were made on October 13th to 16th, inclusive. An inquest was held at Ladysmith, commencing on October 20th, as to the cause of death of the men, and the verdict of such inquest, together with the evidence taken, was duly forwarded by the Coroner to the Attorney-General.

The following are the Reports submitted to the Hon. the Minister of Mines in accordance with his instructions:—

REPORT OF MR. JAMES ASHWORTH.

FERNIE, B. C., November 1st, 1909.

The Hon. Richard McBride,
Premier and Minister of Mines, Victoria, B. C.

SIR,—In accordance to your telegraphed instructions as follows:—

"Can you come to Extension Colliery immediately and report on recent explosion for information of Provincial Government? Wire reply."

addressed to me at Fernie, and which reached me at Lethbridge on the 9th inst., I replied as follows:—

"Leaving for Victoria *via* Spokane and Seattle tonight."

and left by the next train in the evening for Victoria, where I arrived on the afternoon of the 12th, after being detained a whole day in Seattle. Here I was met by Mr. W. F. Robertson, your Provincial Mineralogist, and conducted to your Deputy Minister of Mines, Mr. Tolmie, who handed me written instructions as follows:—

"In the absence of the Honourable the Minister of Mines, I have the honour to request that you will proceed to Extension at your early convenience, and, in company with the Chief Inspector of Mines, Mr. F. H. Shepherd, inspect the No. 2 mine of the Wellington Colliery Company, in which mine a serious explosion recently occurred, resulting in a heavy loss of life.

"On completing your inspection, I shall feel obliged if you will kindly favour the Department of Mines with your report as to the probable cause of said explosion, with such recommendations in the matter as you may think proper."

I left Victoria in the afternoon, accompanied by Mr. Robertson, and the same evening we were in consultation with Mr. F. H. Shepherd, your Chief Inspector of Mines. Arrangements were made to visit the Extension No. 2 mine the next and following days. We drove out each day and made four consecutive visits, and I made a fifth visit on the afternoon and evening of the 19th to show the mine to your legal representative, Mr. Harold Robertson, and Messrs. N. H. Darton and H. M. Wolflin, of the United States Geological Survey Depart-

ment. The latter had been instructed by their Department to temporarily interrupt their inspection of the Roslyn mine, Washington State, where an explosion occurred very recently, and visit the Extension mine. Mr. Darton was recalled by his Department, after attending the resumed inquest at Ladysmith, but Mr. Wolflin remained throughout the inquest and also accompanied the jury on their second visit to the colliery on the evening of the 22nd inst., and evinced great interest in the investigations.

I presented my letter of introduction from your Department to Mr. Little, the Wellington Colliery Company's chief representative at the Extension Colliery, who, as well as the under-officials, showed me every courtesy, and in most cases accompanied our party inside the mine.

The accompanying plan * was prepared by Mr. W. F. Robertson and his assistant, Mr. Nation, from plans and information supplied to them, and also an enlarged plan of same, which was of very valuable assistance to every witness who was called before the Court. Mr. Shepherd also prepared large diagrams of some of the separate parts of the mine, and these figured prominently in the inquiry. In addition to these plans, Mr. Robertson also prepared a drawing on a large scale of the "cave" in No. 2½ level, showing graphically the condition of this particular length of the level.

The Wellington Colliery Company did not produce any plans or explanatory drawings. The first point of importance that presented itself to me was the very small volume of air in circulation in No. 4 counter-level, but I was assured that this was due to the disorganised condition of the mine, although it was the eighth day after the explosion. No great mechanical damage was in evidence on No. 4 West level, but when we reached No. 3 West level there were evidences of contrary forces which required the most careful attention. The first of these was a damaged boot torn off the foot of a labourer named Milos, whose body was found ten or twelve yards on the out-bye side of it, thus indicating that at the time of the explosion his foot had been held fast, possibly by a track-frog, and that the force which affected him had torn his right foot out of this boot, splitting the top of it from the lace-holes to the toe and partly separating the sole from the top, also breaking the fibula of his right leg, and projecting his body out-bye with such force that the top part of his skull was terribly fractured, and this injury caused his immediate death. Dust was also driven into the skin of the face and through his pants into his leg. Still farther out-bye pieces of brattice-cloth showed evidence of contrary forces, and near the foot of room 24 two bodies were found close behind a trip of three loaded cars. They were slightly burned, and some timber was piled on the top of them. The mule drawing the trip appears to have been killed instantaneously, as there is no evidence of its kicking. A strong force had also come down Nos. 24 and 25 rooms from towards No. 2½ West level, tearing down the brattice-cloths and some timber also. Near the face end of the level is room 29, and the condition of this room evidently demanded careful investigation.

Samples of dust were taken off the coal which had fallen from the face, and also off a shovel. Other samples of dust were taken in the level for microscopical and analytical examination. In the level close to the in-bye chute of No. 29 room the body of the miner working in this room was found, and was certified by the doctor as being only burned on the hands. At the face of room 29, which had only recently been started, I found evidence of blasting, and the appearance and position of the coal and of the miners' tools led me to infer that it had had some connection with the explosion, particularly as the fallen coal was thickly coated with dust. I probed behind the coal and distinctly felt that a portion of the shot-hole still remained. On calling the attention of Mr. F. H. Shepherd and Mr. Andrew Bryden to

* This plan will be found at the end of the Reports.

this fact, they assured me that the shot had been fired the day before, and that the fireman said he found it when he made his rounds in the early morning before the explosion. This difference of opinion came to public notice in the Coroner's Court, when Mr. Shepherd expressed his disagreement with my deductions, and the Court was adjourned after the Coroner had directed that the jury should visit the mine and see whether or not there had been a shot-hole behind the broken coal. Messrs. Hawthornthwaite, M. P. P., Mr. Wolflin, U. S. A. Geological Survey, Mr. Cosier, the fireman in question, and others accompanied the party. The result was that my statement of fact was completely verified; and there was the further evidence that the shot had been fired on the morning of the explosion, and that Mr. Shepherd had been very seriously misled by the fireman Cosier. This shot had therefore been fired before the arrival of Mr. Alex. Shaw, who, having temporarily taken up the duties of the usual shot-lighter, had told the men that he would be in the mine by 9 o'clock to attend to the shot-firing. Microscopical examination by myself and others of the dust collected off the coal shows plainly that it has been affected by considerable heat, and this is also proved by the appended chemical analysis:—

"Moisture, 9.69; Volatile Combustible Matter, 21.60; Fixed Carbon, 28.70; Ash, 20.01. The coking of the coal particles of this dust is very distinctly shown under the microscope, also in a sample taken off the top of the coal on the loaded cars between Nos. 23 and 24 rooms."

No. 29 room had an inclination of about 60 degrees, and was fitted with two chutes, down which the coal ran to the level where it was loaded into cars. The body of the miner Thomas, who worked in it, was recovered by a man who crawled in and brought it out of the level before it was considered safe to take a lighted lamp so far, and therefore the exact spot where it was found is only approximately known. The doctor who examined Thomas's body certified that it was burned on the hands and that the man died from carbon-monoxide poisoning. Why he should be burned on his hands only, seems a mysterious feature, but it shows that flame was present at this point. On every occasion when I inspected No. 3 West level I found not less than 3 per cent. of fire-damp mixed with the ventilating air-current.

Proceeding into No. 2½ West level, I found a similar percentage of fire-damp. In No. 27 room there had been a heavy "cave" of the roof coal and practically everything in the room was buried under it. The miner working here, A. Kesorich, had left his room for some reason or other, and was found in the level on the out-bye side of the stall, and where the roof had not fallen. His body was the most severely burned of any in the mine, and the doctor certified that the hair, moustache, head, neck, hands, and left side of the chest were burned by fire. Farther out-bye a heavy "cave" of roof coal had taken place for a length of 240 feet (*see* Mr. Robertson's plan). The top of this cave was coated with dust affected by heat, as shown under the microscope, and therefore it had been deposited after the fall took place. The chemical analysis shows: Moisture, 3.69; Volatile Combustible, 27.70; Fixed Carbon, 36.00; Ash, 32.61.

Out-bye of this fall was a bridge of 36 feet long, where the roof had not fallen, but the timber supporting it had been knocked out by a force from the out-bye side, which had also thrown some of it on to the talus of the 240-foot fall. This force was caused by another cave of 239 feet in length, which at the east or out-bye end was 18 feet high. It was evident, therefore, that this cave took place after the explosion, and that the first-referred-to cave occurred before the explosion. This reasoning is further supported by the fact that some of the timbering that had been set up to support the roof of the first length was standing upright, with the fallen coal all around it.

The ignition and explosion of the fire-damp brought down by the first cave was undoubtedly the force which caused the main explosion and burned the men in the headings

on the higher side of the level from No. 20 to No. 26, and also caused the pressure, burning, and percussive effects demonstrated in these working places.

When the whole of the return air from this section of No. 2 mine was tested for fire-damp in the crosscut between Nos. 19 and 20 rooms, it showed fully 3% of fire-damp. Another evidence of the direction of force on No. 2½ West level was found where No. 15's body was found. This boy had been driving a mule drawing two empty cars, and it is surmised that he was riding on the front car when he was blown into the car and burned on the face, neck, and hands. The mule was either blown or jumped into the first car with its forelegs and was killed. The only animal which survived the explosion was a mule in No. 4 level. Several men on No. 2½ West level, out-bye of the fall, were killed in various places on the level by carbon-monoxide poisoning, and were also slightly burned.

On the 16th inst. I accompanied Mr. F. H. Shepherd and Mr. Bryden to make tests on the volume and humidity of the air circulating in No. 2 West mine. The whole volume of return air amounted to 28,080 cubic feet per minute. For some reason or other the anemometer would not work in the crosscut between Nos. 19 and 20 rooms on No. 2½ West, and no further tests could be made. Hygrometer tests were made in many places, and all proved that the air of the mine was practically saturated with moisture, and in no case was there less than 5.10 grains per cubic foot, and not more than 5.51 grains per cubic foot. The greatest heat of the air inside the mine was only 59 degrees, and the lowest 52 degrees Fahrenheit. The mine was absolutely wet in the majority of places. A test was made with the Pieler spirit-lamp in the whole current of the return air, and although the tip of the flame was ill-defined, it was considered to be equal to a 2% content of fire-damp. The evidence given as to the volume of air circulating through this mine was so various that your legal representative, Mr. Harold Robertson, asked the Coroner to send Mr. Dick, Inspector of Mines, to visit the mine and report the volume passing at three separate points. The estimate given by Mr. Dick in his evidence-in-chief was 17,500 cubic feet at the delivery end of the return, and at the same place Mr. Shepherd had 28,080 cubic feet as his measurement. Mr. Bryden gave three separate estimates of the volume of air in circulation: Firstly, of 90% of the whole return for the working places; then 25,000 cubic feet; and, later, 10,000 cubic feet at the faces. Mr. Dick reported to the Coroner that he measured in the mine return air-way 34,500 cubic feet; in the intake in No. 4 West level, 16,000 cubic feet; and between Nos. 3 and 4 West levels, 6,600 cubic feet per minute. These figures were so conflicting that Mr. Robertson did not cross-examine on them. It is, however, important to consider them very seriously when deciding whether or not the mine was supplied with a sufficiency of air to dilute the gas produced, and to make the mine safe for shot-firing. I have not the least hesitation in saying that, on every one of the five visits I paid to this mine, it was unsafe to fire shots of black powder or giant powder in any of the working places on Nos. 2½ and 3 levels of No. 2 West mine.

The English Royal Commission on Mines appointed a sub-commission, consisting of Dr. Cadman, of the Birmingham University, and Mr. Whalley, an inspector of mines in Scotland, with Dr. Haldane as consultant, to report on the ventilation of mines. After examining mines in England, Scotland, and Wales, they suggested that 2% of fire-damp in the volume of air circulating in any working place should be considered dangerous. This suggestion, however, did not receive the approval of the coal-owners, and a minimum of 3% was suggested by one district as an alternative, and because the majority of officials cannot detect 2% of gas with an ordinary safety lamp. The matter is still *sub judice*, I believe.

As previously stated, there was at least 3% of gas present in the air ventilating Nos. 2½ and 3 levels of No. 2 West mine of the Extension Colliery, and therefore, on this basis, the volume of air was inadequate. What percentage of gas was called a "cap" by the Extension

mine officials was not very clear, but the impression conveyed to my mind was that only such gas was reported as would bring the air-current very close up to the explosive point—that is, far above 3 %. The officials, however, stated in evidence that they considered a half-inch cap dangerous, and some thought 3 % was dangerous.

In Messrs. Dick and Bryden's reports on the volume of air circulating in the mine, a leakage of not less than 27,900 cubic feet of air per minute was unaccounted for, and this leakage shows how important it is that the intake air in a mine should always be measured and compared with the whole of the return volume, and to thus ascertain the percentage of loss. The current of air ventilating the western part of No. 2 mine was also complicated by a current of air coming from No. 4 level east, and thus when the explosion occurred the after-damp driven into the slope through the doors of Nos. 2½, 3, and 4 levels was compelled to circulate with the air into the eastern part of the mine and return through No. 4 West counter-level. The west side might, therefore, have been more quickly cleared of after-damp if a heavy curtain hanging in the diagonal slope to divert the air into No. 4 East had been lifted up, and thus permitted more air to enter No. 4 West counter. It is surprising, therefore, to find that twelve men escaped alive. The question as to whether or not other five men lost their way is immaterial, because they were hemmed in on all sides by after-damp.

I have to suggest, firstly, that the ventilation of the east and west sides of No. 2 mine be by entirely separate air-currents; secondly, that the use of safety-lamps be made compulsory as the means of lighting; thirdly, that only permissible explosives be used in place of black and giant powders; fourthly, that shot-firing be permissible only under statutory regulations; fifthly, that no shot be fired where there is more gas present than would be indicated by a blue cap ¼ inch high.

Increasing the Number of Inspectors.—The popular idea appears to be that more men should be appointed to examine and report on mines, and that such reports should be equal to the standard report of a colliery fire-boss. Personally, I do not think that it will work out as satisfactorily as it might appear probable to do at first sight, because such an inspection lowers the status of an Inspector, who, from my point of view, should be equal to a first-class certificated manager, and should be able to supervise the manager and his officials, in the same way that a first-class certificated manager supervises his under-officials. On this basis an Inspector of Mines would take a more general view of mining, and would in no sense relieve the fire-boss of his responsibility, nor himself assume any responsibility for the safety of a coal-mine.

CAUSE OF THE EXPLOSION.

Although the first cause of this explosion has not been positively ascertained, yet it has been demonstrated that if fire-damp had not been present there would have been no explosion, because coal-dust took no very pronounced share in it. If, therefore, a shot fired in No. 29 room on No. 3 West level were the initial cause, then it is clear that the ventilation was too small in volume to keep the mine clear of gas; but if the fall of roof in No. 27 room of No. 2½ West level came down without the assistance of the disturbance caused by the shot in No. 29 room, then I should say that this very large fall of roof coal, which could not have been foreseen, brought down a large volume of fire-damp, and that the explosion originated at the open light of the miner No. 16, as shown on the accompanying plan.

I have lastly to recommend that double doors be made compulsory in all cases where the system of ventilation is similar to that of the slope district of the mine in question.

Below I append the report of Mr. S. D. Wark, of the Crow's Nest Pass Coal Co., Ltd., Fernie, B. C., on a sample of dust from No. 29 room of No. 3 West level of the Extension mine, No. 2 District:—

HOSMER COLLIERY, EAST KOOTENAY. Machine-shops, etc.

HOSMER COLLIERY, EAST KOOTENAY. Entrance Main Tunnel.

"Two slides were made, one of coal and another of the dust, and examined under the microscope, the object being to try and detect a difference, if any, in the structure of the two. An examination of the dust showed in a convincing way that it had been subjected to fire. It showed a steely grey appearance very much like coke, the boiling or swelling in the process of coking being very pronounced. The coal, on the other hand, showed no such alteration.

"By way of comparison, another slide was made from our own coke, and its likeness to the dust was very distinct.

"Following this, a test was made to try and detect whether any of the volatile matter had been driven off. The sample was first dried for about an hour until it ceased to lose weight, and when examined again the steely appearance was quite evident to the naked eye, differing entirely from the dried coal-dust. An analytical comparison of the two samples shows the following:—

	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.
(29).....	9.69	21.60	48.70	20.01—100 per cent.
Coal	1.05	35.00	56.95	7.00—100 "

and, therefore, a decided contrast in the volume of their volatile contents."

Fernie, B. C., November 18th, 1909.

The Hon. Richard McBride,
Premier and Minister of Mines, Victoria, B. C.

Sir,—Since writing and forwarding my report on the No. 2 Extension mine explosion, I have received a copy of the plan prepared by Mr. W. F. Robertson, blue prints of Messrs. W. F. Robertson and F. H. Shepherd's sketches, and also a copy of the verdict of the jury.

I notice that the plan does not show the entire course of the ventilation before the explosion, and, consequently, the direction in which the "auxiliary" current of air from the down-cast shaft, marked in the right-hand bottom corner, passed through some portion of No. 2 east workings, and was then added to the intake air entering No. 4 West counter-level. The "cap" of fire-damp found in No. 4 West counter-level probably came along with this auxiliary air-current. The plan shows single doors on Nos. 1½ and 2 West levels, as well as on Nos. 2½, 3, and 4 levels, and that coal working was proceeding on No. 1½ level. These single doors evidently account to some extent for the great loss in the volume of the intake air-current entering the lower part of the mine.

With reference to the verdict of the jury, the principal point calling for attention is the apparent assumption that the fall or cave of roof coal in No. 2½ West level took place under normal conditions, and without the assistance of any disturbing influence. It is, however, quite clear that there were other and prior manifestations of force preceding this cave. Thus there was the shot in No. 29 room of No. 3 West level, which was specially uncovered by the Coroner's order for the jurymen to see, and the blowing of the man Milos (No. 6 body) out of his boot.

The positions in which the bodies of several men were found, away from their working places, showed that something had scared them before the explosion occurred at the cave-in on No. 2½ West level. Thus Nos. 2 and 3 men had run out quite 200 feet from the face of No. 3 level; Nos. 7 and 8 had run about the said distance out of the face of No. 2½ West level, and No. 16 had gone out of No. 27 room on the same level. Only one of these men, No. 16, was burned. The absence of burns on bodies Nos. 7 and 8 is of the greatest importance, because Mr. Shepherd fixed on the end of No. 2½ West level as being the place where the explosion originated, for he says, "the explosion was caused by the compression of the atmosphere in the

face of No. 2½ West level." He also acknowledges that there was coking near the face of the level, and of the dust on the loaded car at the face—and yet the men were unburned, and one man left his cap and lamp behind him near the face. Certainly, if these men had been in their working place when the flame of the explosion entered it, they must have been killed on the spot. Mr. Shepherd, in his written evidence, stated that there was no evidence of flame in No. 3 level, but, to my mind, there are most important traces of flame at this point. First, in the fact that the hands of the miner Thomas were burned until the skin hung on them like a glove, and then the fact that the dust I collected in No. 29 stall was coked.

Other important collateral evidence has been found in No. 29 stall—namely, a hole 50 inches deep bored into the roof coal charged with nearly one whole stick of giant powder and fused ready for firing; also another shot-hole 30 inches deep on the left-hand side of the room, uncharged. It is fair to assume that Thomas had drilled a series of three holes, and then removed his drilling tackle into the level; he then charged two holes, in contravention of Rule 9A of the "Coal Mines Regulation Act," and fired one, probably intending to fire the other afterwards. It is not improbable that he was preparing to charge the 30-inch hole also, as two sticks of giant powder (not in a case), fuse, and caps were close to where Thomas's body was found (*see* the enclosed diagrammatic sketches).

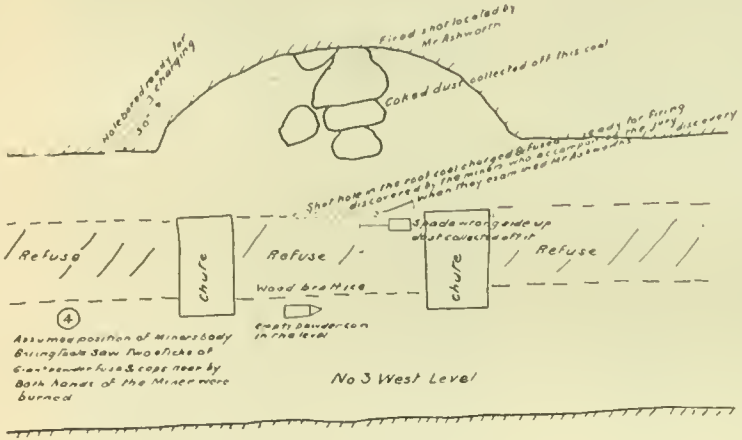
These facts confirm my original opinion that the first factors in this disaster are disclosed in the surrounding conditions of No. 29 stall on the No. 3 West level.

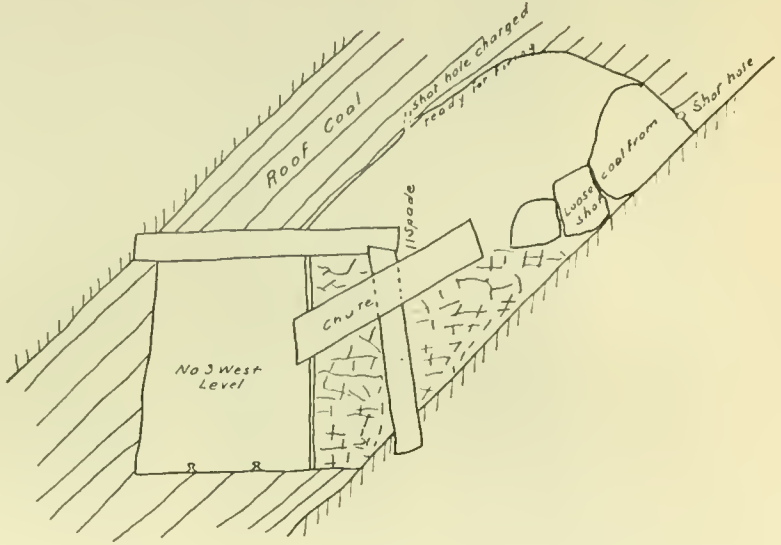
With regard to the jury's No. 3 recommendation, life-saving oxygen apparatus such as the Draeger, Weg, etc., is expensive to buy and expensive to maintain, and if any of these apparatus had been in use at the Extension mine they could not have saved any lives. I might, however, mention a much simpler apparatus which I have often used—namely, the Denayrouse. It consists of a mouth and nose piece and a valve for the expired air placed at one end of a strong flexible tube, which is attached by a belt to the wearer, and the other end of, say, 100 feet of tube is coupled to an air-pump. This apparatus is easily kept in order and may be stored in any convenient place underground.

I am, etc.,

JAMES ASHWORTH,

Consulting Engineer and General Manager of the Operating Department of the Crow's Nest Pass Coal Co., Limited.





DIAGRAMATIC SKETCHES
of
ROOM 29
on
No 3 WEST LEVEL
No 2 MINE
EXTENSION COLLIERY
not to Scale

(Sketch by Mr James Ashworth.)

REPORT BY FRANCIS H. SHEPHERD, CHIEF INSPECTOR OF MINES.

The Hon. Richard McBride,
Minister of Mines, Victoria, B. C.

SIR,—Following my previous advices of the disastrous explosion which occurred on Tuesday, October 5th, in the western portion of the No. 2 mine of the Extension Collieries of the Wellington Colliery Company, I beg to report in detail the result of my examination as to the cause thereof, prefacing the report with details of the explorations made on the day of the explosion and the following day.

On Tuesday, October 5th, at noon, I received a message by 'phone asking me if I had received any report of an explosion having taken place that morning at the Extension mine, and, replying in the negative, I immediately asked to be connected with the Wellington Colliery Company's office at Extension, and was informed that an explosion had occurred in the No. 2 slope, but that no information as to details had come from the mine. I mention this in detail to point to the fact that this office did not receive any notice of the explosion until three hours after it occurred, though the office is in direct telephonic communication with the company's office at Extension.

I made arrangements immediately, and, in company with Mr. Dick, the District Inspector, went to the mine, arriving there at 1.10 P.M.

We at once went into the mine, and, upon inquiry at the landing of No. 2 slope, were informed that, owing to the presence of after-damp, it was impossible to get into the affected area. We went down the slope to No. 4 level, where I met Mr. Andrew Bryden, the manager; Mr. Alex. Shaw, the overman; and Mr. William Cosier, the fireman, and were informed that the exploration had proceeded to No. 3 level, and one body located, but that it was extremely unlikely that any of the men in the affected district remained alive, and that it was not considered prudent to jeopardise more lives until the atmosphere became clearer.

I asked Mr. Bryden to accompany me to where the body had been found, Mr. Cosier, the fireman, accompanying, and upon arriving there we proceeded to make further exploration, with the result that bodies Nos. 2, 3, 4, and 5 were located as shown on the plan. We found the atmosphere somewhat foul, and decided to return to the landing at No. 4 level and organise the bearer party and return, and by that time the atmosphere would probably be clearer. This was 2 P.M. We returned to where we had located the bodies, and the bearer party commenced to remove them.

While this was being done we were joined by Mr. Little, the general manager; Mr. Thomas Graham, manager of the Western Fuel Company; Mr. A. Dick, Mr. S. Mottishaw, Mr. D. Fagan, Mr. T. R. Jackson, Mr. John Campbell, Mr. P. Celle, and Mr. Shillito.

I should mention at this point that Mr. Dick, in going down the slope, had gone into No. 3 level, probably thinking that I had gone in there, and he went into that level until he came to a cave, and then returned.

The above exploring party then commenced to explore No. 3 level, first towards the face and then in an outward direction towards the slope. Body No. 6 was found, as indicated, near the foot of room 25, and bodies 7 and 8, now marked 18 and 17, were found behind the loaded trip, which had been heading out; the mule was lying in front dead. We found the atmosphere only fair, but pushed on and encountered several caves, and as we drew nearer to the slope the atmosphere improved, until it became almost pure when we reached the door.

As the atmosphere where the bodies lay was still charged with a considerable percentage of after-damp, I suggested to Mr. Bryden that he and I return to the bearer party and see that they were all right, and, if so, to commence the exploration of No. 2½ level.

We went into room 10, off No. 4 level, and ascertained that the party was all right, and then went up to No. 2½ level, where we met Mr. Graham and Mr. Dick, who informed us that they had been into the level as far as the parting, and found three bodies, and deeming it inadvisable to proceed farther, returned. The full exploring party now proceeded into No. 2½ level and found bodies, up to and including body No. 15, this being the mule-driver, who had evidently been going in with an empty trip. In proceeding beyond this point we encountered a heavy cave, composed chiefly of fallen coal, and we went along this cave for a considerable distance, and found our progress blocked. We then went down a crosscut and travelled along the counter-level, and then up again on to the cave inside the obstruction noted, and continued along the cave until it was estimated that we could not be a great distance from the face of the level, and decided to return. This would be about 5.30 p.m.

Upon returning along the level we endeavoured to get up into room 22, but found standing gas about 60 or 70 feet up the room.

We then returned to the slope, and feeling fairly sure that there were no lives to save, decided that further exploration would be better accomplished by commencing to restore the ventilation, and arrangements were accordingly made.

With the exception of rooms 20, 21, and 22, we had fairly covered the whole of the exploded area. We found the atmosphere still charged with a percentage of after-damp, but on account of the ascensional feature embodied in the lay of the workings and the heat evolved by the explosion, the affected area was clearing rapidly; in fact, it was due to this feature that we were enabled to explore the area before the systematic restoration of the ventilation had been attempted.

We then went to the surface, arriving there about 7.30 p.m.

On Wednesday morning, the 6th inst., upon reaching the mine we learned that the bodies of the two men who had been working in the face of No. 2½ level had been found in room No. 25, just above No. 3 level. Five bodies had also been found in room No. 9, off No. 4 level, making a total of 23 up to that time.

We went into room 22, off No. 2½ level, where efforts were being made to clear the gas out, and during the afternoon bodies 24 and 25 were found as shown. The gas was moving slowly, and it became apparent that it would be some time before the gas would clear sufficiently to reach the remaining bodies in rooms 20, 21, and 22.

These bodies were reached the following morning, when all the bodies were declared out of the mine.

Examination as to Cause—Method of Working.

The method of working is room and pillar; the rooms being about 21 feet wide and the pillars about 60 feet. The dip of this section of the mine varies considerably, ranging from 10° to 35°, but the variation is due to the existence of a long roll or flexure of the strata, and extending diagonally across the greater portion of the area under consideration, but the general dip does not much exceed the former figure.

The area is won by slope, levels being driven at convenient distances, and the room-and-pillar system obtaining between the levels in the actual mining operation. The room details consist of a haulage-road on each side of the room and a gob in the centre, supported by the ordinary post-and-brattice method. Compound sets, or post and bar, support the roads where necessary. Where the inclination is too great for the ordinary method of haulage, chutes are substituted for the roads mentioned, but the other details are the same as described.

The advanced portions of the levels and counters or other narrow work are ventilated by board brattice.

No pillars have been drawn in the exploded area, and the old workings are standing fairly well. The old rooms are holed through to the counter in all cases, and are thus kept clear from accumulations of standing gas.

The mine was worked with naked lights, but the system prevailed of giving each pair of miners a safety lamp for precautionary measures. The lamp used was the bonneted Clanny. Blasting was permitted and the explosive used was 30 % giant powder with ordinary fuse and detonator.

The mine was universally damp, and in some places wet.

The following hygrometric observations were taken October 16th, 1909:—

Place.	Dry Bulb.	Wet Bulb.	Per cent. of Hgc. M.
Mouth of main tunnel	54 degrees.	49 degrees.	69 per cent.
No. 2 West return	56 "	56 "	100 "
Mouth of No. 2½ level	57 "	56 "	93 "
Top of room 22 (No. 2½ level)	57½ "	56½ "	93 "
Wargo's place "	58 "	57½ "	97 "
Petersen's place "	59 "	57½ "	90 "
Room 20 "	59½ "	58 "	91 "
Face of No. 3 level	56 "	55 "	93 "
Face of No. 2½ level	57 "	56 "	93 "
Top of room 25 (No. 3 level)	56 "	55 "	93 "

There was very little dust in evidence and the samples obtained were mixed with shale dust, as shown by the high percentage of ash in the analysis.

The area in question was ventilated partly from the east side, where the intake was an air-shaft, to the surface, and partly from air direct from the main tunnel, the junction of the currents taking place in the slope at No. 3 East level counter. From this point the current went down the slope; thence along No. 4 level and counter, and thence along the faces of Nos. 3 and 2½ levels, afterwards ventilating rooms 22, 21, and 20, and reaching the main return at room 17; thence in a fairly direct course, and ascensional, to the fan.

Condition of the Mine Previous to October 5th, 1909.

Inspector Dick's Report, September 6th, 1909, is as follows:—

"September 6th, Wellington Extension Collieries, No. 2 Mine.—I went into this mine by the way of No. 1 tunnel; thence down No. 2 slope to No. 3 and 4 west levels. I was in the above-mentioned levels, all roadways and working places, and much of the old works. From here I went to the east side and in No. 4 East level, as well as the slope. I was in all the roadways and working places, crosscuts and old workings.

"I saw that the above-mentioned workings were well timbered. Ventilation good. I saw that there was a strong current of air passing. I did not test the quantity, as I had omitted to take my instrument with me. I examined the above-mentioned workings with a safety-lamp and failed to find or see a trace of explosive gas.

(Signed) "Archibald Dick."

Mr. Dick's previous ventilation returns for this section of the mine:—

"March 8th, 1909—27,000 cubic feet per minute = 473 c. f. per unit" (each mule is assumed here to equal 3 units).

"August 10th, 1909—17,920 cubic feet per minute; 224 c. f. per unit."

September 6th, 1909—Strong current, as stated in his report.

The last report of explosive gas in this section of the mine was on August 14th, 1909, as follows:—

Fireman's Report Book: "6:30 a.m. Barometer 29.7 inches. Examined the working places; found gas in 3 West level, old slope, and gas in crosscut off 12 stall, Diagonal slope other places in good order.

(Signed) "T. R. Jackson.
" "Wm. Cosier."

The gas in the crosscut off No. 12 stall, Diagonal slope, is on the east side of No. 2 slope, and not tributary or immediately pertaining to the area covered by the explosion. (F. H. S.)

The fact then remains that no explosive gas had been reported for fifty-five days previous to October 5th, 1909.

The Condition of the Mine on the Morning of October 5th, 1909.

Fireman's Report Book: "6:30 a. m. Barometer 29.9 inches. Examined all working places; found all in good condition.

(Signed) "Hugh T. Fulton.
" "Wm. Cosier."

The mine, therefore, on the morning of the explosion was reported clear from explosive gas. The places were being worked with naked lights and the men had been at work in their several places for something near one and one half hours before the explosion took place. This would seem to eliminate, therefore, the possibility or probability of the initial cause being due to the ignition of a body of standing gas.

The subjoined barometrical chart, taken at the office of the Inspection Department, about six miles distant from the mine, would show that there was no sudden fluctuation of the barometer, and this would preclude the probability of gas issuing from old workings, should such inaccessible old workings exist; but this contingency was not borne out by the examination, for the direction of force seemed to indicate that the explosion had spent itself in the expansive wastes, instead of emanating therefrom.

The next probable cause which suggests itself would be that of a badly planted or blown-out shot, and with a view of ascertaining whether such probable cause existed, the following detailed examination of every working place in the District was carefully made, and is submitted in detail as follows:—

Details of Examination.

On Thursday, October 7th, we commenced our official examination, commencing at No. 4 level and working upwards, following the ventilating current. This examination continued until October 16th, but we were joined by Mr. James Ashworth, M. E., and Mr. W. Fleet Robertson, the Provincial Mineralogist, on the 13th inst.

Face of No. 4 Level Counter.—Worked by W. Edminston, who escaped. Drill-hole in coal-face, 5 feet 6 inches, well placed. Drill screw and two sticks of giant powder, made up, and tamping-bar in face. No evidence of a shot having been recently fired or of any dangerous conditions.

Face of No. 4 Level.—D. Irwin, escaped. Recently holed to crosscut. Coal loose. Pick and shovel near. No evidence of recent blasting or dangerous conditions.

Room 15, off No. 4 Level.—Aleck McClellan, lost. Auger in face making holdfast hole for drill-stand. No evidence of recent blasting or dangerous conditions. Powder out in box intact. Tin case No. 393. No. 391, three sticks of giant only. He was on the afternoon shift. Name, Wilson. McClellan's tools piled in order against brattice.

Room 14, off No. 4 Level.—A. Radford, escaped. Hole started in face as shown. Free and well judged. Stall high and 8-foot bench in face. No dangerous conditions here. No cars on either road. Powder found: No. 313, seven sticks; No. 213, five sticks; No. 338, eight sticks. All lying 20 feet outside room 14 on low side of level; No. 213, one pound of black powder and one stick of giant in box with fuse. (NOTE.—*See* excerpt from the evidence of Alex. Shaw *re* the presence of black powder in this section, Appendix "B.")

Crosscut from Room 13 towards Room 14.—R. Smith, escaped. Shot well placed. Drill in hole. Empty car in face, and no dangerous conditions. Full car on each track. Powder at level on lower side, about 30 feet outside room No. 13; No. 269, six sticks giant powder; No. 369, six sticks. Powder-box, two one-half coils fuse, and caps. The level-driver's empty trip of cars are standing partly up room 13 and partly on the level.

Room 12, off No. 4 Level.—A. Dewar, escaped. No hole; conditions good. Full car on inside road. Place very high; about 12 feet. Powder: No. 367, eight sticks giant powder in crosscut between rooms No. 11 and 12. Lunch-bucket. Fuse on gob in stall. At the No. 11 end of this crosscut there are eight sticks of giant powder in an empty oil-drum—No, 319, H. Coulter—and one black-powder can with 3½ pounds of black powder belonging to a miner who had not worked for three weeks, and who had previously worked in another section of the mine where the use of black powder was permitted. No dangerous conditions.

Room 10, off No. 4 Level.—R. White, lost. Hole in bottom coal. Drill in hole and not fired; direction rather solid, but not dangerously so, and the shot, of course, not fired as stated. No evidence of force in any of the places so far examined. All the men rescued from this section came through No. 4 level or counter.

Face of No. 3 West Level.—T. O'Connel and James Molynieux, both lost. A shot had been fired in the face and partly loaded out. The drill-stand was in place for another hole. No dangerous conditions here. The shot had done its work well. The car was half loaded, and an empty car turned up at the pass-bye, a short distance out from the face. Two shovels and a drill were lying in the face. The safety-lamp hung up on the post. No sign of force in face. Gas in face. Powder-cans, four sticks of giant powder in leather case, two sticks made up and lying on the dumped car; third lot of powder out consists of one full can of eight sticks. Bratticeman's (Moffat) hatchet, and patches in the face of the level. His bucket of nails was found with body.

Room 29, off No. 3 West Level.—T. Thomas, lost. A shot had been fired that morning, but had done its work well. Thomas had loaded two and three-quarter cars from this shot and about three cars remained unloaded in the face. His pick and shovel were in the face as shown. The body of Thomas was found at the foot of the inside chute. No dangerous conditions. Coat hung inside room 29. At foot of 29 one and one-half sticks of giant powder were found. Some tools and saw on level. (*See* deductions for further comment upon this room.)

Room 28, off No. 3 West Level.—Not working that day.

No. 2½ West Level.—Wm. Keserich and George Bardovino, both lost. Bodies found near foot of room 25, off No. 3 West level. The hole in the face was just commenced and was well judged. Two shovels, brace, and hammer in face. Cap and open lamp in front of car which is standing in the face loaded. Safety-lamp hung up on brattice. No dangerous conditions here. Two sticks of giant powder and one leather case containing seven sticks of giant powder out at the top of room 25. Evidence of coking strong at top of room 25 where it connects with No. 2½ level, and also further out near room 27.

Room 27, off No. 2½ Level.—Aleck Keserich, lost. Room heavily caved. Hole started in face, well placed. No standing hole or other evidence of dangerous conditions. Car under cave on inside road. His powder cannot be found, but may be under the cave. Axe and boring-tools in face.

Crosscut to Left of Room 22, off No. 2½ Level.—T. Bullish and Ramovich, both lost. About 10 inches of an old hole on the solid. The hole had been fired that morning, probably, and partly loaded out. Four-foot hole on upper rib, well placed and not fired. No coking in crosscut. Two cars had been loaded, one had been taken out and the other remains. Powder in next crosscut down room. No. 213, seven sticks. Safety-lamp in working place on lower side. Shovel in face. No dangerous conditions.

Room 22, Standing.—Two burned coats as shown and strong coking. Log rolled from upper side, and curtain driven from the direction of Wargo's place.

Wargo's Slant or Heading.—Wargo lost. Bottom coal had been partly loaded out after blasting. No dangerous conditions in evidence. Loaded car in face and four caps around and near the car. Three open lamps. Shovel just in front of car. Body found top of room No. 21.

Room 21, Standing.

Petersen's Crosscut.—Petersen lost. Had been a shot in bottom coal, but partly loaded out. No sign of other blasting. Body in face. Safety-lamp near face. No dangerous conditions in evidence. Heavy coking on right-hand rib.

Room 20.—C. Salo and O. Nynman, Nos 290 and 291, both lost. No sign of blasting in face. Face caved in centre. Pick in face. Loaded car, shovel, and two caps. Powder cannot be found; 4 pounds of giant powder issued on the 2nd and 4 pounds on the 1st. No safety-lamp found. No sign of coking in face, but on right-hand rib farther down stall.

The foregoing includes every working place in this section of the mine which was in operation on the morning of the 5th October. There is no evidence of a blown-out shot, or a shot badly placed or overcharged, and there is no evidence of *any* shot having been fired immediately preceding the explosion. In this connection I beg to quote from the evidence of three practical miners who accompanied the jury round the workings of the exploded area.

David Moffatt, sworn, sayeth as follows (questioned by the Chief Inspector):—

Q.—You made an examination of the mine at the time the jury examined it, the face of each working place? A.—Yes, sir, I did.

Q.—Did you find any signs of dangerous blasting conditions, or blown-out shots? A.—No evidence that I could see.

Parker Williams, sworn, sayeth as follows (questioned by the Chief Inspector):—

Q.—You examined the working faces of the mine at the time the jury went through? A.—Yes, sir.

Q.—You examined up to room 20? A.—I think so.

Q.—Did you find any evidence of a blown-out shot? A.—No; I took more than ordinary care in examining the shots that had been fired.

William Robertson, sworn, sayeth as follows (questioned by the Chief Inspector):—

Q.—You went around those working places? A.—Yes.

Q.—Did you notice any conditions, with regard to the face, of remaining shots—anything that would indicate dangerous conditions with regard to blasting or otherwise? A.—No, sir.

Details of the Cave on No. 2½ Level.

The cave previously referred to extends for a distance of 515 feet along No. 2½ level, commencing near room No. 24 and extending almost to room No. 27. For the whole of this distance, the fallen material came from a "roll," or faulty condition of the seam and overlying strata, where the strata is broken and fractured and the coal crushed and frenzied.

The geological reason for the existence of this long line of fracture is due to movement after the formation of the field. A well-defined basin exists in the area covered by No. 2 mine, east and west of the slope, and the formation of this basin no doubt took place at the same time, and the attendant faults and dislocations are due to the strata conforming to the altered conditions.

The "roll" is not a dislocation or throw, but a bent and flexured condition marking a severe change in the dip or inclination of the strata.

The result has been to impart an instability to such portion of the coal which formed the roof of the driven level so as to prevent the safe opening of rooms in the long stretch between rooms Nos. 26 and 27; rooms Nos. 23 and 24 being confined to narrow drivages for the same reason.

The condition, therefore, would probably be such that, where the cohering or adhering stability had become greatly reduced by the fractured condition of the superincumbent coal and shale, it would require very little concussion to commence the cave, and, having once commenced, the principle of following leverage would precipitate the whole. It is very possible that the cave might have been caused in the absence of any concussion whatever, by the force of gravity overcoming the stability of the fractured mass, and once commenced, the extensive character of the cave can be reasonably accounted for.

It might be suggested that the liberation of gas under the pressure at which occluded gases exist in the strata forced down the cave, a condition often found in winning drivages, but not, as a rule, in portions of the mine which have been driven some time, and from which the occluded gases have become drained.

During the driving of this section of the level, gas did exude in such quantity as to render the use of safety-lamps and blasting precautions necessary, but this condition passed away months before, and naked lights were again allowed, fairly proving that the occluded gases had, to a great extent, transpired and the gas-pressure been relieved.

As evidence of the non-gaseous condition of the cave, I may mention that the exploring party was over a great portion of the cave on the afternoon of the day of the explosion, when the ventilation was entirely disconnected, and no explosive gas was found even in the highest points.

Mr. W. Fleet Robertson, the Provincial Mineralogist, made a very detailed examination of the cave, and from surveys made at the time, prepared the sections which accompany this report, which are comprehensive and self-explanatory and which set forth very clearly the contortionary character of the "roll."

There was no evidence of coking on the cave, and none between a little to the east of room 27 and room 22, a distance of nearly 800 feet. The timbers protruding through the cave bore no evidence of flame or coking. Though the timbers, dust, curtains, and the clothing on the bodies found to the east of the cave showed no signs of burning (bodies 9 to 15), the exposed portions, such as the face, neck, and hands, show slight burns, but evidences of singeing are reported by Dr. Mullin to have been found on body No. 14 (Selburn), found near the foot of room 21.

To the west of the cave, however, at the foot of room 27, coking is strongly in evidence, but this seems to be local, for there is no evidence of coking between this point and where the coking again reappears at the top of room 25, where it holes into No. 2½ level from No. 3 level.

Direction of Force.—No. 4 level stoppings show force downward from No. 3, and the door forced open towards the slope. No. 3 force came down room 25, and in a lesser degree down room 24; split at the foot of room 25 and went inwards, as shown by the curtains being blown in, brattice at the foot of a prop, the position of the body of Milos (Milanich), and his boot being blown 40 feet farther in. This force cushioned in the dead end of No. 3 level, spending some of its energy down room No. 9, and in a lesser degree down room No. 11, where Coulter experienced the black smoke; went outward from room 25, as indicated by body No. 6 (Taylor) and by wreckage covering bodies 7 and 8 (now 18 and 17).

No. 2½ force indicates inward direction by strong evidence at top of room 25, off No. 3 level. Force cushioned in dead end of No. 2½ level face.

Force indicated going outward from east end of large cave by trip of empty cars, which was going in, as shown by driver being blown from front car to between the first and second cars, and the front part of the mule being blown into the first car. Force outward continued, as shown by all bodies but No. 13 being found head out towards the slope; No. 13 lying across with head to upper rib.

No indication of force shown at foot or lower portions of rooms 22, 21, and 20, but all the rooms indicate a downward force from top of rooms to first crosscut down, and across rooms 21 and 22 as coming from Petersen's heading.

The stoppings on the outer portion of No. 2½ level generally blown up, but the force not great, indicating the expenditure of force from that portion of the explosion which spent into the old rooms between Nos. 2½ and 3 levels.

Evidence of Flame and Coking.—No evidence of either flame or coking in any portion of No. 4 level or workings. Distinct evidence of flame at the foot of room 25, off No. 3 level, where the force came down from No. 2½ level, as shown by the burnt condition of body No. 6 (Taylor). Strong coking at the top of room 25, off No. 3 west level, where it holes to No. 2½ level, extending inwards towards the face of No. 2½ level for about 30 feet. Microscopic examination of dust from the car in the face showed slight evidence of coking.

In an outward direction in No. 2½ level, evidence of coking just west of room 27 and for a few props in an easterly direction. This is confined to the immediate vicinity of room 27, at the bottom only.

No evidence of coking on the cave, or on the timbers protruding through the cave, or in the counter-level below the cave. No evidence of coking between a little east of room 27 and the upper portion of room 22.

There is no evidence of coking in Bullish's place to the left of room 22. There is strong evidence of coking at the top of room 22. Evidence of heat is shown on the brattice in Wargo's place. Coking is shown on the outer rib of room 22, extending down as shown. Strong evidence of coking on the lower rib of Petersen's crosscut, and strong evidence of coking on the outer rib of room 21. Coking shown on crosscut between rooms 22 and 21, and also between 21 and 20. Room 20 shows no sign of coking in face, but coked on outer rib of room from the crosscut up, as shown.

Analysis of Samples of Dust by Herbert Carmichael, Chief Assayer Mines Department.

	Moisture.	Vol. Com. Matter.	Fixed Carb.	Ash.
(1.) Sample from car opposite stall 24	1.6	13.6	35.2	49.6
(2.) Sample from top of room 25 (coarse)	1.4	13.2	63.2	22.2
(3.) Sample 20 feet east of room 27	1.4	16.0	50.2	32.4
(4.) Sample near body No. 10 (small pieces, little dust)	1.8	14.0	24.0	60.2
(5.) Sample off car in face, No. 2½ level	1.2	20.8	52.8	25.2
(6.) Sample from east end of cave	1.4	14.2	32.8	52.2
(7.) Sample from room No. 29, No. 3 level	1.4	18.8	34.7	45.1

(Signed) HERBERT CARMICHAEL,
Government Assayer.

The previous analyses corrected to a normal analysis of the Extension coal containing 6 per cent. of ash :—

	Moisture.	Vol. Com. Matter.	Fixed Carbon.	Ash.	F. C. / V. C. M.
(1.) Sample from car opposite stall 24	1.6	25.7	66.7	6.00	2.59
(2.) Sample from top of room 25 (coarse)	1.4	16.0	76.6	6.00	4.78
(3.) Sample 20 feet east of room 27	1.4	22.4	70.2	6.00	3.14
(4.) Sample near body No. 10 (small pieces, little dust)	1.8	34.0	58.2	6.00	1.70
(5.) Sample off car in face of No. 2½ level	1.2	26.3	66.5	6.00	2.50
(6.) Sample from east end of cave	1.4	28.3	64.3	6.00	2.26
(7.) Sample from room No. 29, No. 3 level	1.4	32.6	60.0	6.00	1.83
(8.) Normal analysis of Extension coal.	2.00	35.0	57.0	6.00	1.63

(Signed) W. F. ROBERTSON,
Provincial Mineralogist.

November 17th, 1909.

The ratio of V. C. M. to F. C., therefore, would show that the samples which had been least affected by heat are samples (4) and (7), the latter being from room 29, off No. 3 level; and the sample most affected is the sample of coke from the top of room 25, sample (2).

Deductions and Theory as to Cause.—The mine was universally damp, as shown by the hygroscopic observations referred to.

The evidence would tend to show that upon the morning of the explosion there was approximately 2 per cent. of marsh-gas in the atmosphere of this section of the mine (No. 2 West mine); this conclusion is arrived at from the evidence of the firemen and the overman when cross-examined as to the condition of the mine atmosphere generally; and the evidence would also show that there was no body of standing or explosive gas reported that morning, or more recently than August 14th.

The fireman with the ordinary safety-lamp cannot detect with certainty a percentage of 2 per cent. of CH_4 in the mine atmosphere, and, as far as his duties are concerned, he would, if this condition obtained, pronounce the mine clear; but from the evidence given it may be conceded that 2 per cent. was present.

The minute examination of every working face has shown that there remains no evidence of a blown-out, chambered, or badly planted shot, or that a dangerous explosive was used in blasting, and there is no evidence to support the theory that *any* shot had been fired immediately preceding the explosion.

The theory has been advanced by Mr. Ashworth that in room 29, off No. 3 West level, such a badly planted shot did exist, and, of course, to have any bearing upon the initial cause of the explosion it would have to have been fired immediately preceding the explosion.

The notes of my examination covering this place are as follows:—

"A shot had been fired some time that morning, but had done its work well. Thomas had loaded two and three-quarter cars, and about three cars of unloaded coal remained in the face. His pick and shovel were in the face as shown. The body of Thomas was at the foot of the chute (inside). No dangerous conditions. Coat hung inside room 29. One and a half sticks of giant powder and Thomas's tools and saw on level."

The pick and shovel lay in the room in the position of having been used to load out the shot referred to. The chute (the outside one) was empty and a few lumps in the inside one. The car was found off the track, three-fourths loaded, 30 feet outside the outside chute of room 29, and it would appear that Molyneux and O'Connel, whose working place was the face of the level, had pushed this car ahead of them until it struck a piece of fallen rock which threw it off the track. O'Connel was endeavouring to get past the car between the car and the lower rib when he was overcome by the after-damp; his partner fell at the rear of the car at the same moment. It seems probable that Thomas came from his room after Molyneux and O'Connel had passed.

There is no evidence of force in the vicinity of room 29. The 1-inch brattice-boards were not disturbed and the chute curtains hung in a normal position, and were not torn or otherwise disturbed.

The analysis of the sample of dust taken from room 29 would indicate that no undue amount of heat or coking obtained in this room. The back of Thomas's hands were slightly burned according to the evidence of Dr. Mullin, but the exposed arms and parts of other bodies bore similar traces where the clothing or hair did not indicate burning or singeing. The humid condition of the mine could under the sudden application of heat, in the absence of actual flame, produce conditions such as were found on some of the bodies, which were reported burned but not singed.

There is no evidence of flame either going in or coming out of the face of No. 3 level inside of the foot of room 25, where Taylor's body was found, but the evidence of force going both inwards and outwards from this point are plain and indisputable, and the analysis of Mr. Carmichael would not indicate the presence of heat of sufficient intensity to alter the volatile hydro-carbon of the impalpably fine dust of the sample obtained.

Further evidence that there was no shot fired in room 29 at the time of, or immediately preceding, the explosion is furnished by Hillis Coulter, the nearest survivor to room 29. Room 11 was holed through to No. 3 level, and Coulter in his evidence states that he did not hear any report immediately preceding the explosion, or any report accompanying the explosion—and the distance measured along the open connection from where Coulter was working to room 29 is only 170 feet. This evidence is also supported by Paul Wranovich, who worked in room 10, the distance of which from room 29 by the open connection is also 170 feet.

In order to clear up any doubt as to the condition of the shot in room 29, the writer requested the Coroner to have the shot cleared away and examined by two practical miners whom the jury should select, and request the members of the jury to be present while the examination took place.

This was done, and the following excerpts taken from the evidence are herewith submitted:—

James Nimmo, sworn. Cross-examined by the Chief Inspector:

Q.—Do you consider that it was a dangerous shot? A.—I consider it a very good shot.

Q.—Any dangerous conditions? A.—No.

Cross-examined by Mr. Hawthornthwaite:

Q.—A good shot or a blown-out shot? A.—In my opinion, it was a very good shot and not a blown-out shot.

Eugene Lowe, sworn. Cross-examined:

Q.—Was that a good shot? A.—It was a very good shot.

Upon this point, therefore, I can only add to my opinion as stated in my evidence, that:—

(1.) The shot in room 29 was not fired immediately preceding the explosion.

(2.) That it was a well-placed shot and had been partly loaded out.

(3.) That there is no evidence of force or heat in room 29 which would indicate that a blown-out or badly placed shot had been fired in this room.

Therefore, I cannot concur in Mr. Ashworth's opinion that a shot from this room was the initial cause which brought down the cave in No. 2½ level, or contributed in any way to the cause or propagation of the explosion.

I should mention here that a charged hole was found by the two miners who examined the room, in what to all the previous examiners, including the writer, appeared to be the roof of the place, but which was top coal, and this shot was the first breaking-in shot. This would only confirm the opinion expressed, for no practical miner or shot-lighter would fire one shot while he had another charged 6 feet distant.

The evidence would tend to show, therefore, that there was present in the mine atmosphere a certain percentage of marsh-gas, which, under ordinary conditions, would not be considered dangerous, but under extraordinary conditions, such as a blown-out shot, an explosion of powder in the open atmosphere of the mine, a sudden and heavy cave, or any other cause which would cause a sudden compression, would become so.

I beg to quote from the "Coal and Metal Miners' Pocket-book," page 361:—

"*Pressure as Affecting Explosive Conditions.*—Gaseous mixtures that are not explosive in the ordinary condition of the mine often become so under the momentary pressure to which they are subjected by heavy blasting, and in some instances they may occur from the concussion of the air caused by the quick shutting of a door. In the latter case, however, the explosive conditions of the air would necessarily have to be close to the limit, in order for such a slight occurrence to precipitate an explosion. The factor of pressure as increasing the explosiveness of gaseous mixtures should be considered and constantly borne in mind."

Accepting this theory, then, that light concussions would be dangerous to the atmosphere quoted, it would reasonably follow that heavy concussions would render dangerous atmospheres charged with much lower percentages. Such a condition of the atmosphere, therefore, would cause an explosion if it came in contact with a naked light; and it is very probable it might cause an explosion in the absence of any light in its course, in support of which theory I beg to quote Beard's "Mine Gases and Explosions," page 172:—

"Experiments are quoted as proving that it is possible to cause a spark by a sudden compression of *pure air* in a glass cylinder by quickly forcing down a tightly fitting piston. Mr. Joseph Dickinson, H. M. Senior Inspector of Mines, Great Britain, stated in his evidence before the Royal Commission (1891) that he had with such a device struck a spark in pure air fifty times, but that he could never get a spark twice from the same air. An instrument was devised on this principle for the purpose of testing for fire-damp in mine workings by Dr. Angus Smith, who supposed it required from 1 to 2 per cent. of marsh-gas in the air to produce the spark, but this was found not to be the case. Whether or not this illustrates what takes place on a larger scale in a mine can only be conjecture, but the percussive theory has gained

many strong adherents, prominent among whom are Mr. Joseph Dickinson and Mr. James Ashworth."

In further proof of this theory there is a Prussian invention for the ignition of mine shots by the application of this very principle, the application of the cylinder and piston, the shot being ignited by the heat evolved by the sudden compression of the air within the cylinder.

In further support of the theory of heat and flame, evolved by compression, I beg to quote from a recent issue of "Mines and Minerals," October, 1909:—

"*Flame in Compressed-air Pipes.*—Editor "Mines and Minerals."—Sir,—I have noticed Philip Scott's letter re 'Flame in Compressed-air Pipes,' and the editor's invitation for correspondence on the subject. About fourteen years ago, when the Alberta Railway and Coal Company first put in percussion mining-machines, they had a large Ingersoll-Sergeant straight-line cylinder (single) air-compressor that ran the heat up in compression to about 500° Fahr., which not only once, but frequently, caused the oil that accumulated in the receivers to ignite, and cause small explosions. At such times the receivers would become red and the pipes for over 100 feet would also become red-hot. These pipes for a long distance in the mine would be too hot to put one's hand on them. We have never seen any flame come out of any pipe opening, nor have we heard of any of our men who have; but the flame and smoke resulting from these explosions have on several occasions driven the men out of their working places—out of all working places that had an open valve. * * * H. L. D. W. Lethbridge Alberta, Canada."

But in this case the inflammable medium is present in the shape of oil.

Practically applying the foregoing principles, I beg to again quote "Beard," page 172:—

"The records of mine explosions abound with instances in which the fatal blast was felt with equal suddenness and violence in distant parts of the mine. Other recorded instances show the practically simultaneous explosions of gas in distant portions of the mine isolated from each other by long stretches of roadways and air-passages that were found to *bear no trace of flame having passed through them.* The percussive theory assumes that a wave of compression imparted to the air by the force of the initial explosion is transmitted almost instantly to other portions of the mine, where sufficient heat is developed by the resistance it meets to cause ignition to other bodies of gas accumulated there."

Such conditions, I am of the opinion, obtained in the present case, with the exception that there were no bodies of accumulated gas in any portion of the exploded district, but that portions of the mine charged with a certain percentage of marsh-gas became explosive under the sudden application of percussive pressure.

The large cave which occurred in No. 2½ level extended for a distance of 515 feet, in two portions, being divided in the centre by a distance of 36 feet where the measures seem to have been sufficiently stable to break the continuity of the fall or cave. The cave contained about 1,000 tons of fallen material, principally friable coal, falling through a vertical distance of 7 feet. This represents a dynamic force of about 7,000 foot-tons which suddenly displaced about 27,000 cubic feet of air, transmitting its force and velocity through the narrow drivages of the mine, which upon meeting with resistance at the dead ends, or cul-de-sacs, sudden deflections and restricted portions of the roadways created a compression of the mine atmosphere, which under ordinary conditions would not be considered dangerous, into an explosive condition.

The largest dead end, or cul-de-sac, is formed by rooms 22, 21, Wargo's heading, and Petersen's crosscut, from the first crosscut up and shown upon the accompanying drawings,

and in consequence of this large area the evidence of flame is more pronounced here than in any other portion of the exploded district; and in the absence of force, or evidence of flame at the foot of rooms 20, 21, and 22, it is very probable that this explosion expended its energy in this locality. Room 20 may be considered a separate dead end, and the explosive force developed there expended itself in a similar manner.

The coking at the foot of room 27, off No. 2½ level, would respond to the compression in the room, which was up about 30 feet. The remaining evidence of flame and coking is at the top of room 25, not far from the face of No. 2½ level. The combined compression due to the dead end of No. 2½ level and the right-angled deflection down room 25 would account for the heavy coking at this point.

The character of the explosion was one of low intensity, due no doubt to the absence of dust and the damp condition of the mine and the large area into which expansion could take place. With the exception of the large cave on No. 2½ level, the wreckage was singularly small. There were three or four small caves on No. 3 level, principally where rooms had been broken away from the level, but in each case the amount of material was loaded up into six or seven cars. There was very little evidence of force in the area made up by the rooms 21, 22, Wargo's heading, etc. No report was heard on the slope or on No. 4 level and workings. No report was heard in No. 1½ level, where eight men were at work.

Many of those who were lost had moved some distance, and nearly all the bodies in No. 2½ level were found as if heading out for safety.

Keserich and Bardovino (7 and 8) had evidently travelled from the face of No. 2½ level to where they were found near the foot of room 25, a distance of 160 feet. Molyneux and O'Connel (2 and 3) had probably travelled about 220 feet, all of which would tend to confirm the theory of low intensity and the absence of shock. Bodies 5 and 6 showed evidence of force, but they were directly in the track of the explosion developing at the top of room 25.

The gaseous condition of the mine atmosphere during the days of exploration and examination subsequent to October 5th was due, in a great measure, to increased temperature and the dynamic energy evolved by the explosion; the latter quantity, though low, would still contribute to the liberation of occluded gases. This condition is noticeable in all explosions of gaseous mines, especially where the dynamic energy and consequent temperature have been high. This was notably the case at Cumberland and Fernie. At the former explosion the return air at the fan continued to be in an explosive condition for days.

On October 15th and 16th the percentage in the return from the exploded district was 2 per cent., and on November 6th, at my final examination prior to granting permission to commence operations, the percentage was 1 per cent. The auxiliary split coming into the slope at No. 3 level counter contained ½ of 1 per cent., and at the face of No. 4 level counter 1½ per cent. It must be remembered that no mining operations had been carried on since the explosion.

Conclusion.—With a view of decreasing the deplorable loss of life which stands out in unenviable prominence in the history of coal-mining in the Province, it is meet that the lessons which these disasters teach should receive the earnest consideration and co-operation of those who are interested, directly or otherwise, in the safe working and development of the industry.

The question has often been asked, Why is the loss of life in the coal-mines of British Columbia so much larger, in proportion to the ratio of the number of persons employed, than in most other countries? And the question has never been satisfactorily answered.

It may be conceded that the physical structure of the field has in no small degree contributed its quota to the unenviable record. This is especially true of the Crow's Nest Pass

coalfield, where conditions exist without a parallel in the coal-mining world, notably the tremendous outbursts of gas of the Morrissey mines of that field, and the gaseous condition of the field generally.

The Coast field also possesses difficulties not met with in more regular fields, and possesses physical features which produce conditions requiring the utmost care and vigilance.

The rapid development of the industry in recent years demands that the statutory safeguards keep pace with the development, and in this regard it is essential that modern life saving appliances be installed in the various mining centres.

In a field scattered over such a large area, and so far removed from the older centres of mining, it follows that the general class of mining labour available cannot be selected so as to insure the maximum degree of efficiency, experience, and safety.

The chief lesson to be learned from the recent disaster is that dangers may exist in the mine atmosphere which are not apparent to the ordinary mine official, and it should be made incumbent upon the management and under-officials of the mine to determine at all times the condition of the mine atmosphere with regard to low percentages of marsh-gas, and take necessary precautions with a view of anticipating even such an unusual contingency as obtained in the present case. Appendices and drawings are hereto attached.

I have, etc.,

Francis H. Shepherd,
Chief Inspector of Mines.

APPENDIX "A."

List of Persons Killed in the Extension Explosion, October 5th, 1909.

No.	Name.	Occupation.	Age.	Nationality.	Doctor's Remarks.
1	Andrew Moffatt	Bratticeman	42	Scotch.....	No burns, CO.
2	Thomas O'Connell ...	Miner	27	Irish.....	No burns, CO.
3	Jas. Molyneux.....	Miner	36	English.....	No burns, CO.
4	Thomas Thomas	Miner	29	Welsh.....	Slightly burned on back of hands.
5	Alex. Milanich (Milos)	Labourer ...	28	.....	Fractured skull and right leg. No burns.
6	Harold Taylor.....	Labourer ...	30	English.....	Severely burned on face, neck, and hands.
7	William Keserich....	Miner	38	Slavonian...	No burns, CO.
8	Geo. Bodovinac.....	Miner	25	Austrian....	No burns, CO.
9	Robert Marshall.....	Pusher	25	Scotch.....	Slight burns on face, chest, and hands.
10	Wm. Robinson	Miner	35	Scotch..	Slight burns on face, chest, and hands.
11	Peter Nieland.	Pusher	39	English.....	Deep cut on back of hand.
12	John Ewart.....	Pusher	38	.....	Slightly burned on face.
13	Charles Scheff.....	Labourer ...	27	Scandinavian	Slightly burned on face.
14	W. A. Selburn	Labourer ...	45	American ...	Burned on face, neck, and hands.
15	William Quinn	Driver.....	18	Canadian ...	Face burned, gloves on hands.
16	Alex. Keserich	Miner	21	Austrian....	Severely burned on face, neck, and left side, chest, and hands.
17	William Davidson ...	Driver.....	17	.....	Slightly burned on face and hands.
18	Edward Dunn.....	Driver.....	17	Canadian ...	Slightly burned on face and hands.
19	Fred Ingham.....	Bratticeman	23	American ...	No burns, CO.
20	Winyard Steele	Pusher	25	American ...	No burns, CO.
21	Alex. McClellan. ...	Driver.....	36	Scotch.....	No burns, CO.
22	Robert White.	Miner	46	Scotch.... .	No burns, CO.
23	John Isbister.....	Tracklayer..	48	Canadian ...	No burns, CO.
24	John Bulish.....	Miner	34	Austrian....	Slightly burned on face and hands.
25	Mike Gustav.....	Loader	30	Austrian....	Burns on back of neck and hands.
26	Oscar Nyman	Pusher	28	.....	No burns, CO.
27	Charles Salo	Loader	30	Hungarian ..	No burns, CO.
28	Thompson Parkin ...	Miner	27	American ...	No burns, CO.
29	Todd Rombovia	Miner	42	Austrian....	No burns, CO. (1st degree burns).
30	John Wargo	Miner	43	Slavonian...	Burned on face, neck, and hands.
31	Mike Danculovich....	Runner.....	25	Austrian....	Burned on neck, face, and hands.
32	Herman Petersen	Miner	43	Dane	No burns, CO.

List of Issues of Giant Powder (30%) to the Exploded District in October, 1909.

No.	Name.	1st.	2nd.	4th.	5th.
		lbs.	lbs.	lbs.	lbs.
211	John Wargo	3	.....	.....	3
231	John Bulish	4	2	4	2
238	Robert White	.....	.....	.....	2
244	Alex. Keserich	.....	4	4	.....
260	Thomas O'Connell	4	4	4	.....
273	Herman Petersen	4	.....	4	.....
281	Thomas Thomas	4	.....	.....	.....
290	Oscar Nyman	.....	4	.....	.....
291	Charles Salo	4	.....	.....	.....
393	Alex. McClellan	4	.....	.....	.....
504	Jas. Molyneux	4	4	.....	.....

No black powder issued to the above.

Sworn to at the inquest.

(Signed) J. W. LEWIS.

The two cases of black powder (1 lb. and 3 lbs.) found in No. 2 level workings belonged to miners who had worked in other portions of the mine where black powder was used. The man owning the 3 lb. case had not worked for three weeks. This was sworn to by Alex. Shaw, who stated that black powder was prohibited in the whole of the district west of the slope.

NOTE.—*See* also supplemental report made by Mr. Shepherd in June, 1910, which follows these Reports.

REPORT BY W. F. ROBERTSON, PROVINCIAL MINERALOGIST.

The explosion in No. 2 West mine, Extension, operated by the Wellington Collieries Company, occurred on October 5th, 1909, at about 8.35 A.M. This mine is one of a group, operated through the same main rock tunnel and forming the Extension Collieries. The responsible management consists of Mr. F. Little, general manager of the Wellington Collieries Company; Mr. Andrew Bryden, manager of Extension Colliery; and Mr. Alexander Shaw, overman of No. 2 West mine, all of whom hold first-class certificates of competency.

The explosion was confined to No. 2 West mine and the fatal effects to the inner portions of Nos. 2½, 3, and 4 West levels. As a result of the explosion, thirty-two men were killed, while a number escaped or were rescued, all the men in the mine being accounted for. Of those killed, twenty-seven were killed by the explosion, or so soon afterwards by gas, that nothing could have saved them, and these men were all in Nos. 2½ and 3 West levels. The remaining five men were not killed or injured by the explosion itself, but in trying to escape, being mistaken as to where the explosion had occurred, ran into workings at the bottom of room 9, off No. 4 West level, where they were overtaken by gases, the products of the explosion, and killed. Twelve men who had been in company with these five men in the attempt to escape, took another course and made their way to No. 4 level, at the bottom of room 13—inside of the curtain on the level—where they remained in fresh air until found by the rescue party, shortly after the explosion. Among the five men thus overcome by gas, there were three who, by the nature of their occupation, must have known every part of the mine as well, if not better, than the officials.

Rescue Work.

From the evidence it would seem that the inspectors only received word of the explosion after noon—some four hours and a half after it occurred—but by 1.10 p.m. Chief Inspector Shepherd and Inspector Dick arrived at the mine, having driven over from Nanaimo. About this same time, Mr. Thomas Graham, manager of the Western Fuel Company's Colliery, appeared at the mine, volunteering his services and entering the mine with the inspectors, continued with the rescue parties all day, taking command of one—an example of what may be expected of our mine managers or miners when there is rescue work to be done, even in mines in which they have no responsibility.

Manager Andrew Bryden and Overman Shaw, assisted by the workmen, appear to have gone to work promptly and intelligently with the rescue work, and by following in No. 4 counter—the intake air-course, which was practically intact—succeeded in rescuing twelve men from No. 4 level, at the foot of room 13. The evidence of the survivors and of Overman Shaw is that the after-damp was down on to No. 4 level—outside of curtain between Nos. 12 and 13 stalls—very shortly after the explosion and long before any rescue party could have reached No. 9 stall; consequently, I think it was quite impossible to have saved the lives of the five men whose bodies were found in this stall, and that if oxygen helmets, &c., had been present, they could not have served any purpose under the circumstances.

General Description of the Mine.

From the coal-tipple at Extension a level main rock tunnel, about 8 by 12 feet, has been driven into the hill, in the rock underlying the coal-seam, for a distance of 5,200 feet to a point locally known as the "Cog," where the tunnel cuts the coal-seam. From the Cog, levels have been driven in the coal to the right and left along the strike of the seam, and, from these drivages, slopes are down at three separate points, and each of these slopes, with the levels, &c., driven off from it, constitute practically a separate mine, known respectively as No. 3 mine, No. 2 East, and No. 2 West, each with distinct and separate ventilating currents. It was in No. 2 West mine that the explosion occurred, its origin and effect being localised to only a portion of that mine. My examination, therefore, was confined to the No. 2 West mine, and more particularly to that portion of the mine affected by the explosion, viz.: the slope and levels from No. 2½ level down No. 3 and No. 4 levels and counters.

I attach hereto a copy of the mine plan * showing the workings and scene of the explosion.

Ventilation of the Mine.

The accompanying plan shows the course of the ventilating current, but it may be briefly described as follows:—

No. 2 West mine is ventilated by a current of air from the No. 2 East mine air intake shaft, taken out in the form of a "split," which does not pass through the working places of No. 2 East mine, and enters the No. 2 West mine on the Diagonal slope. This main air-current is augmented by a current of fresh air entering by the main rock tunnel, which is split at the "cog," a portion of it for No. 2 West mine following down the No. 2 West slope to the Diagonal slope. From this point these air-splits form the general ventilating current and follow the Diagonal slope down to the bottom or deepest portion of the mine, thence entering the counter of No. 4 West level, continuing to the face of that level, circling around the working places at the extreme limits of the mine, and eventually into the return air-way (the upward extension of the slope) above the level of the main tunnel. The main air-

* A photo-reduction of this plan, to the scale of 275 feet to the inch, follows these Reports.

current, in following around the working faces where the greatest exudation of gas would take place, leaves the interior areas of the mine, consisting of pillars between stalls and levels which have been for some time completed, without direct ventilation other than is provided for by the leakage purposely permitted at the various doors and stoppings on the slopes and levels, each leakage finding its way through the old workings and eventually to No. 2½ level and the main air-return. The leakage that thus takes place appears to be ample for the purpose and constituted a large proportion of the ventilating air.

The volume of air travelling in the return airway for No. 2 West mine *before* the explosion, according to the report of Inspector Dick, was 18,000 cubic feet per minute, and according to the overman it was 25,000 cubic feet, as observed at the same point, and during this investigation, *after* the explosion, it was 28,000 cubic feet.

The maximum number of men reported as employed in the mine at any one time was fifty-six men with seven mules, and, if we take the lowest recorded velocity of 18,000 cubic feet per minute, this provides about 300 cubic feet per minute for each unit, or three times what the law specifically demands, and, according to the reports of the Inspector and of the fire-bosses, a sufficient amount of this current was conducted to the faces to dilute the air to such a point that no cap was discernible in a safety-lamp. The overman, Mr. Shaw, testing the air with a special lamp the week before the explosion, found a "trifle less than 2% gas in the return airway." (*See* his evidence at inquest.)

Dust and Humidity.

The mine was not a *wet* mine, in the sense of producing much water, or containing much standing water, as these two features were noticeably absent, but the workings throughout were very *damp*, seemingly produced by the condensation of the moisture of the air on the cooler surfaces, which, when touched anywhere by the hand, were found to be wet.

The air throughout the mine was found to be nearly saturated with moisture, as is indicated by the following series of hygrometric observations taken during our investigation, the figures given being the percentages of humidity found in the air at various points (absolute saturation being taken as 100%):—

Humidity of Air.

Air outside of mine, near mouth of main tunnel	69 per cent.
Air in main return airway from all No. 2 West mine	100 "
Air at mouth of No. 2½ West level	93 "
Air at top of stall No. 22, No. 2½ West level	93 "
Air in Wargo's incline	97 "
Air in Petersen's crosscut	90 "
Air in room 20, off No. 2½ West level	91 "
Air in face from No. 3 West level	93 "
Air in face from No. 2½ West level	93 "
Air in top room 25, off No. 3 West level	93 "

In view of the fact that the air in its course meets comparatively little standing water in the mine, the great increase in the percentage of moisture in the air would argue that the moisture therein contained must be derived chiefly from the strata, and consequently that the strata are normally moist. This is borne out by the observations in the mine, the coal-seam is composed of alternating bands of very hard, solid coal, and softer, more porous, shaly layers; the former, when broken, will make some dust, but the latter practically none. Any dust which may be formed by the breaking of coal will, immediately upon coming in contact with the roof, sides, or timbers, which are moist with the condensed humidity of the air,

become *mud* at once. I repeatedly and at various points in the mine tried to blow dust off the sides or timbers, but failed to find any. Another indication of the general humidity of the mine is the growth of fungus on the timbers, and it was noted that even the hardwood pick-handles, which must have been in use on the morning of the explosion, were found, less than ten days later, to be covered with a growth of white fungus.

From these facts and observations I conclude that, of dust accumulated in the mine, there was none, and that such dust as a factor of causing or extending the explosion may be eliminated from all consideration.

Barometric Pressure.

The barometric pressure may in this case be absolutely eliminated from all calculations, as having no possible influence upon the cause of the explosion. I append hereto the chart from a self-recording barometer, kept in the office of the Chief Inspector at Nanaimo—some six miles away—for the week in which the explosion occurred, which shows that there was no appreciable variation about the time of the explosion.

In the second place, in this mine there were no old goafs, or workings, in which gas could accumulate and be drawn out by a diminishing barometric pressure, while any variation in the atmospheric pressure would have no appreciable effect on the amount of gas given off by the virgin coal.

Shots.

During the course of my examination I visited every working face in the mine, and I append hereto sketches, prepared by Mr. Shepherd, showing the condition in which each place was found, and these sketches I do indorse as substantially correct and corresponding to my own observations. Without entering into the details of each place, which are sufficiently given by the sketches, I am thoroughly satisfied by the evidence found in each place that no shot had been fired immediately preceding the explosion, and, consequently, that the cause of the explosion was in no way connected, either directly or indirectly, with shot-firing. In a large number of the working places the holes had been bored for shots, and, in every instance seen, these holes were well judged and placed, and would, if fired, have been safe shots, which would seem to indicate that the "practice of the mine" in this respect was safe.

At the inquest Mr. Ashworth stated in his evidence that in his opinion there had been a "blown-out shot" fired in room 29 of No. 3 West level (Thomas's place) immediately before the explosion, whereas Chief Inspector Shepherd and I had previously testified that we were satisfied that *no such shot* had been fired in No. 29 *immediately* prior to the explosion. In view of this discrepancy as to the facts, the Coroner postponed the inquest and ordered the jury to appoint two good practical miners and to accompany them into the place, to move away the coal and see if a blown-out shot had been fired as indicated by Mr. Ashworth. The jury next day reported that they had appointed James Nimmo and Eugene Lowe, two miners, and had gone with them into the mine. These two miners gave evidence that they had removed the coal from the shot indicated by Mr. Ashworth and found it to have been a "good shot," not blown out, the bottom 6 inches from the floor, and that two carloads of coal had been loaded from the shot since it had been fired, which seemed to dispose of the question, and that the shot had been fired some time previous to the explosion and could not have had any part in it. Furthermore, an unfired shot was found in the place in the roof coal with the fuse still in it; this was subsequently taken out and the hole found to be 4 feet 2 inches deep—a good hole loaded with three-quarters of a stick of giant powder ($\frac{3}{8}$ lb. of 40% dynamite).

I might further say that the cloth bratticing at the entrance to the chutes was less than 8 feet from the shot Mr. Ashworth considered "blown out," and that this bratticing was uninjured, which it must have been by a "blown-out shot" of any magnitude. A sample of dust taken from this room 29 was subsequently analysed by the Government Analyst, Mr. Carmichael (*see* sample 7, Table of Analyses herewith), the analysis showing that this dust had been but very slightly, if at all, affected by heat. The blistering found on Thomas's hands was, therefore, more probably caused by steam than by flame.

Caving of Roof.

The only important caving seen in the mine after the explosion was in the vicinity of No. 2½ level and in its counter. Examination showed that there had been a cave in room 27, extending from near the face of the room on to the level, consisting of roof coal and rock roof. The main cave, however, was on No. 2½ level, from a point a few feet outside of room 27 to a point just outside of room 24, a distance of about 520 feet, for the whole of which distance the level was caved, with an exception of an intervening length of 36 feet about midway in its length, so forming really two cavings of 240 feet each with an interval between them of 36 feet.

It would appear that the inner of these cavings, viz., from rooms 27 to 26, came down first, followed by the outer caving, viz., from rooms 26 to 24, for the reason that all the timbers in the uncaved interval of 36 feet are toppled down towards the face of the level and some of the timbers are lying on top of the talus or end of the inner caving. As this "cave" was undoubtedly the chief factor in causing the explosion, a more detailed description is given.

There appears to have been a "roll" in the coal-seam and the enclosing rocks, which is in evidence in the workings in rooms 23 and 24 above No. 2½ West level, and in room 25 off No. 3 West level, where it appears between No. 3 West and No. 2½ West levels, and again in room 28 off No. 3 West level, where it is below No. 3 level. At these extreme points the "roll" is long and more gradual, but between these points it appears to have become shorter and more abrupt. The "roll" appears to have been followed by No. 2½ level, at least from No. 24 to 27 stalls. Over the level the roof rock formed an inverted "U" or arch in which the coal was very much flexured and flaky, due to the folding movement, which formed the "roll," which also produced a slicken-sided surface or parting between the coal and roof rock. No. 2½ level was driven for over 500 feet under this "roll" in the roof, for the usual height of 7 feet, apparently without knowledge of its existence or character; it was timbered with posts and caps in the usual way, as had been sufficient elsewhere in the mine. There was, therefore, left in the roof of the level, to a thickness of some 6 to 7 feet above the timbers in the centre, coal of a very soft, flaky nature, so soft in character and breaking so short that, for about 480 feet along the level, it caved around and about the timbers and stringers, many of which were still left standing after the fall.

The accompanying scale drawings show actual sections taken across this "cave," showing the section of the roof and coal-seams. This "cave" is entirely coal, no roof rock having come down, and represents approximately a volume of 27,000 cubic feet containing about 1,000 tons of coal.

The indications are that this "cave" fell *prior* to the explosion, as the timbers therein show no tendency to fall in one direction, and, in fact, many have *not* fallen, the coal falling through them and leaving them standing, while on top of the "cave" the small quantity of dust lodged there on the surface of the coal appears under the microscope and by analysis to be somewhat coked. (*See* sample No. 6, Table of Analyses.)

The Explosion.

From the evidence of the mine afterwards, the explosion would appear to have been confined to No. 2½ level, from stall 17 in to the face and to the rooms above it, and within this area only was there to be seen any definite signs of flame or excessive heat. I have marked on the accompanying map the spots where "coking" was visible, viz. :—

On No. 2½ West level, at head of room 25, off No. 3 West.
" " " bottom of room 27.
" " " top of room 22, and in crosscut and in Wargo's incline.
" " " top of room 21 and Petersen's place.

Such coking as was found was *very slight*, and appeared to have been the effect of flame passing rapidly, and for a short period of time acting upon wet coal-dust, and only partially coking it, as, under the microscope, the material was shown to be *only partially coked*. During the examination of the mine, samples of the damp dust were collected at various points in the mine, and subsequently submitted to the Government Analyst at Victoria, Mr. H. Carmichael, who reports as follows :—

Victoria, November 17th, 1909.

Analyses of Coal-dust from Extension Mine.

	Moisture.	Vol. Com. Matter.	Fixed Carbon.	Ash.
(1.) Sample from car opposite stall 24	1.6	13.6	35.2	49.6
(2.) Sample from top of 25 (coarse)	1.4	13.2	63.2	22.2
(3.) Sample 20 feet east of 27	1.4	16.0	50.2	32.4
(4.) Sample near body No. 10 (small pieces, little dust)	1.8	14.0	24.0	60.2
(5.) Sample off car in face of No. 2½ level	1.2	20.8	52.8	25.2
(6.) Sample from east end of cave	1.4	14.2	32.2	52.2
(7.) Dust from room 29	1.4	18.8	34.7	45.1

(Signed) Herbert Carmichael,
Government Analyst.

It is evident from the abnormal amount of *ash* found in these samples that the samples represented a mixture of coal-dust and shale-dust, and consequently, before they can be used in comparison with the normal dust produced from coal in this mine, they must be recalculated to the basis of *normal ash* contents of such coal, as has been done in the following table. The only guide that the analyses would give as to whether the dust had been affected by heat is the *ratio between the percentages of vol. combust. matter and fixed carbon*, and these are shown in the following table :—

Corrected Analysis of Dust from Extension Mine.

Calculated from Determination to Normal 6 % Ash.

	Moisture.	Vol. Com. Matter.	Fixed Carbon.	Ash.	Ratio F. C. / V. C. M.
(1.) Sample from car opposite stall 24	1.6	25.7	66.7	6.0	2.59
(2.) Sample from top of room 25 (coarse)	1.4	16.0	76 6	6.0	4.78
(3.) Sample from 20 feet east of room 27	1.4	22.4	70.2	6.0	3.14
(4.) Sample near body (10) 2½ W. level, bet. rooms 17-18	1.8	34.0	58.2	6.0	1.70
(5.) Sample off car at face 2½ W. level	1.2	26.3	66.5	6.0	2.54
(6.) Sample from East (outer) end of cave	1.4	28.3	64.3	6.0	2.26
(7.) Dust from room 29	1.4	32.6	60.0	6.0	1.83
(8.) Normal analysis of coal from Extension	2.0	35.0	57.0	6.0	1.63

EVIDENCE OF THE FORCE OF THE EXPLOSION.

The direction of force, where seen, is indicated on the map by red arrows, and it will be noted that it all emanates from the heads of rooms 21 and 22, off No. 2½ West level, and from the inner part of this level. The force expanding into the worked-out pillar areas of Nos. 3 and 4 levels so lost its intensity as to leave no trace, other than the jarring of stoppings in this area. The intensity of force was, in my opinion, in no place very strong, but seemed to be strongest at the bottom of room 24, off No. 3 West level, having come down that room and toppled over a few props; in fact, this is the only instance where I was convinced the force of the explosion was sufficiently intense to move posts. It is true that on No. 2½ level, in the unfallen section of 36 feet between the portions of the big "cave," the props and stringers are all out, apparently knocked *inwards* by some force, but I am of the opinion that this may have been produced by the caving of the adjacent roof.

As to the evidence adduced that Milos (body 5) and one of his boots were found separated, it is possible that his boot caught in something, possibly a railroad frog, and that in his terror he wrenched his foot free from the boot, tearing the boot and breaking a small bone in his leg in so doing, and in the darkness ran headfirst into a timber, crushing his skull. There was similar evidence of a mule being found with his forequarters in a car in No. 2½ West level, at the foot of room 23, but I think the mule, being terrified, jumped into the car and was not blown into it.

My reason for refusing to accept either of these instances as evidence of intensity of force is, that a blast of air of sufficient intensity to have produced the results mentioned would, of necessity, have left many corroborating evidences of its action, such as props and bratticing blown out, etc., and I was unable to find any such corroboratory evidence, while, at the same time, I think the facts as found are quite as well accounted for by the hypothesis I have suggested.

That the explosion and its force were very local is shown by the evidence of Hillis Coulter, who escaped, and who was working in a crosscut off room 11 in No. 4 level—it did not blow out his light—an open light; also, men working on the return airway, on No. 1½ level, never knew an explosion had occurred.

This localising of the explosion to such a small area would indicate to me that the general atmosphere of the mine was not so charged with gas as to be very near the exploding point, even in the return airway just past the working places, for if it had been, the explosion, once started, would have continued farther.

It seems, therefore, the raising of the gas constituent in the air-current to the point of ignition (or the lowering of the point of ignition of the mixture by compression) must have been a very local, and not a general, condition.

The stoppings in the mine were of very frail construction, consisting of inch boards nailed on to posts, and none of these were absolutely blown out, only jarred loose, except in the immediate vicinity of the "cave," where they would probably have been blown out by the "cave" anyway. The direction of force on the stoppings, where noticeable, is indicated on the maps by arrows.

The bratticings on No. 2½ level were mostly well blown out except at the inner end of the level, past the last raise. On No. 3 level, from rooms 24 to 28, they were out, but inside of this last-mentioned room they were found intact. In the rest of the mine they were still found standing.

A couple of boards nailed on to the outside of the posts, above the door near the entrance to No. 4 level, were blown off, as this was probably due to a compression of the mine atmosphere and not to the continuance of the blast of the explosion. The trapper boy just outside the door was not hurt.

I am, therefore, forced to the conclusion that the explosion was of very local occurrence, was not transmitted or conveyed to any distance from its point of origin, and was of exceedingly low intensity, partly because it had room for expansion.

The medical evidence indicated that all of the deaths were caused by C.O. (carbonic oxide), except Milos, whose skull was crushed before there was time for him to be killed by C. O., as he undoubtedly would have been. It seems to me, therefore, that the explosion was an explosion or explosions of a mixture of gas and air, not at nearly the most explosive limit.

Summary of Evidence as to Cause of Explosion.

From the evidence of the management, the mine made a certain amount of gas (CH_4), and the air-current, by the time it had passed all the working faces, contained "a trifle under 2 per cent. gas." (Overman Shaw's evidence.)

The No. 2½ West level, from room 24 in to 27, has been driven within the past six months, and while it was being driven there was an unusual amount of gas given off at that point, so much so as to necessitate the use *of safety-lamps exclusively;* the coal above this part of the level was, therefore, more than usually charged with gas. The mine gives evidence that:—

The "cave" in this level occurred prior to the explosion, and probably in two successive falls.

That the explosion was local, and confined to a certain section, and that there was nothing to extend or continue it; consequently, the general air-current and atmosphere of the mine was not so heavily charged with gas as to be explosive or inflammable.

This is evidenced by the fact that men working in No. 1½ level, on the return air from where the explosion occurred, did not even know of the explosion, and had to be told to come away from their working places. The mine was so damp that *no dust could exist.* No shot could have been fired *so immediately prior* to the explosion as to have been even a remote or contributing cause or factor in the explosion.

There was no explosion of powder, as practically all the explosives have been found unused.

Cause of Explosion.

As to exactly how any explosion occurs is usually a matter of speculation based upon all available evidence, which is often insufficient or contradictory, and the theory, therefore, insecure; but in this case, it seems to me that there is little contradiction in the evidence of the witnesses examined, or of the facts as found in the mine after the explosion, and the following theory as to the cause of the explosion seems to me the most probable, in keeping with the known facts:—

An extensive "fall" suddenly occurred in No. 2½ West level, from No. 26 to No. 27 stalls, dropping a great many tons of flaky coal, charged with gas. This fall liberated an unusual amount of gas, which, following up rooms Nos. 26, 25, and 24, rose into the three "dead ends," at the heads of rooms Nos. 22 and 21—all in virgin coal—so augmented the percentage of gas already in the atmosphere as to render it explosive; while the fall of the roof creating a rush of air into these "dead ends" may have caused a compression of the atmosphere, thereby lowering the point at which the gas and air mixture would be explosive, and so served as a contributing factor.

Naked lights were used everywhere, and one of these probably ignited the mixture and caused an explosion at the head of rooms Nos. 20, 21, and 22, at which points all the victims were killed near to where they were working, although, in Wargo's place, they evidently had

some warning, as three caps and lamps were found above the car, while two of the bodies were found in the crosscut at the head of room No. 21, indicating that the men had taken flight—probably at the noise of the cave and its consequent disarrangement of the velocity of the air-current—and had run out of their working places, sufficient time for which would be given while the gas was travelling from the "cave" up to the head of room 22, a distance of 600 feet.

This first explosion probably brought down the "cave" in No. 2½ West level between rooms 26 and 24, and this fall, together with the explosion, would force the air back along No. 2½ level towards the face, across the first fall of coal, which would be still giving off gas. This gas possibly encountered, at the foot of room 27, a naked light carried by Keserich (16), who would have come down from his room, No. 27, at the noise of the first "cave," and the gas was probably here again ignited, as Keserich's body showed more evidence of burning than did any of the other victims. It is also possible that the first ignition at the head of room 22 may have been transmitted along the air-course, against the intake air-current, here recently augmented in its gas constituents, continuing its explosion to the face of No. 2½ level.

The men working at the face of No. 2½ West level undoubtedly had warning of the danger, and ran about 200 feet before they dropped.

There is little doubt but that the "cave" was the *direct cause* of the explosion; but what started the "cave" is not so certain.

The peculiar geological formation of the shale roof above the fall, spoken of as a "roll," would certainly account for the management's ignorance of the amount of coal actually above the timbers—the conditions were abnormal. (*See* sketches herewith.)

There had been no sign of "weighting" on the timbers, such as usually gives warning of an impending fall of such magnitude, and the "roll" in the roof would account for the suddenness with which the "cave" occurred. The cave may have started from its own weight, as there is no evidence of any sudden jar or shock in the mine at the time.*

On this point, however, it is interesting to note that the seismograph in the Meteorological Observatory at Victoria showed and recorded, on the morning of October 5th, what the observer, Mr. Denison, describes as an "abnormal change, due to an unusual wave in the earth's surface." Whether this movement was greater, or less, at Extension than at Victoria, there is no information, nor is it definitely known as yet whether a movement on the surface would be felt with equal intensity so deep underground. The matter is mentioned as only a *possible* cause for starting the cave, in the absence of any other known possible cause.

RECOMMENDATIONS.

Where the ventilating fan is located so far from the main exit of a mine, as it is at Extension, the fan-house should be in constant telephonic connection with the manager's office; in the case of a long entry tunnel (as at Extension, one mile long), telephonic connection should also be made with the overman's office at the Cog. No. 2 East and No. 2 West mines, Extension, from the Cog in, should be kept completely separate, and while one of these mines is on safety-lamps exclusively, access into that mine from the other should only be through locked doors, with screens, if necessary, for ventilation, or by passing a lamp station in charge of a responsible man.

SHOT-FIRING AND SHOTLIGHTERS.

While shot-firing had apparently nothing to do, in any way, with the explosion at Extension, the evidence indicated that General Rule 9A was not carried out in its entirety, with respect to the shotlighter examining the hole *before* it is charged, to see that the coal was well prepared,

* See also Supplemental Report made by Mr. Shepherd, June, 1910, which follows.

the hole properly placed, cleaned, &c. There is also some doubt whether the miner having a hole ready and charged always waited for the shotlighter to come around, but fired his own shots when he got ready, against orders and regulations. It is *practically impossible* to enforce the Act as regards shot-lighting, where fuse is employed. Where safety-lamps are demanded, it is demoralising to the men to see a shotlighter light a fuse *with an open light.* As a remedy for all this, I would suggest the advisability, in cases where safety-lamps and shotlighters are demanded, of shots being fired only by means of electric batteries, and that the electric batteries and electric fuses or detonators be carried by the shotlighters only, and not served out to the men.

Rule 9, subsection (*d*), provides that "*fine coal or coal-dust shall not be used as tamping.*"

The holes are supposed to be tamped with broken shale, clay, &c., but there is good reason to believe that coal and coal-dust *are* used as tamping, the moment the Inspector's back is turned.

In the United States they are now using wet wood-pulp for tamping, with very satisfactory results, and I think it would be well if we did the same.

Wm. Fleet Robertson,
Provincial Mineralogist.

SUPPLEMENTARY REPORT BY FRANCIS H. SHEPHERD, CHIEF INSPECTOR OF MINES, *RE* EXTENSION EXPLOSION.

The Hon. Richard McBride,
Minister of Mines.

Sir,—In consequence of the recent discovery of additional evidence in the exploded area of the No. 2 West mine, of the Extension Colliery, and in order that all the available information appertaining to this disaster may appear simultaneously in connection with the publication of the reports upon the same, I beg to submit the following Supplementary Report, covering the recent discovery of a badly planted and partially blown-out shot in room 27, off No. 2½ West level, where Aleck Keserich was working.

While at the Extension mine, on June 13th, I was verbally notified by the manager, Mr. Thomas Russell, that a new room immediately inside room 27 had holed into room 27 near the face, and had developed evidence of a badly planted and partially blown-out shot in the left-hand or westerly rib of that room.

It appears that, after holing to room 27 and advancing the face of the new room referred to, a portion of a chambered hole was discovered, extending about 3½ feet into what had been solid rib.

According to the statement of Manuel Delcourt, one of the miners in the new room, about 9 inches of the hole was cut off by him in forming his own rib, leaving by actual measurement 2 feet 7 inches of the chambered hole still intact. I made measurements from which the attached plan and section are made. Judging from the evidence remaining in room 27, it would appear that the hole had originally been about 5 feet 10 inches deep, and the bottom portion of the front of the shot had yielded to the charge, leaving a triangular piece of top coal, as shown on both plan and section herewith. The shot, therefore, is described as a *partly blown-out shot* because a portion of the energy of the shot had been

expended in this blasted portion. The chambered portion remaining is 6 inches in diameter and 2 feet 7 inches in depth, to which must be added the 9 inches stated by Delcourt to have been cut off by his room. This would make the total length of the chambered hole 3 feet 4 inches, the whole of which distance appears to have been on the solid, and past the line of what appears to be the formed rib of room 27.

The wall of the chambered portion is not smooth, a condition which generally obtains in chambered shots, but indicates a cutting action rather than an expansive action, due to unrelieved pressure. This may be explained by the fact that the pressure at the back of the hole was to some extent relieved by the front of the shot yielding.

The concussion or wave of compression from a shot of this nature, while not producing the maximum effect, would be very considerable, and it is very probable that it caused the cave in room 27, and this combined condition might easily account for the larger cave on No. 2½ West level.

I am of the opinion, therefore, that this shot supplies the missing link needed to connect up the theory previously advanced, that the explosion was due to a wave of compression caused principally by the heavy cave in No. 2½ West level, and that this cave was primarily caused by the badly planted shot here referred to.

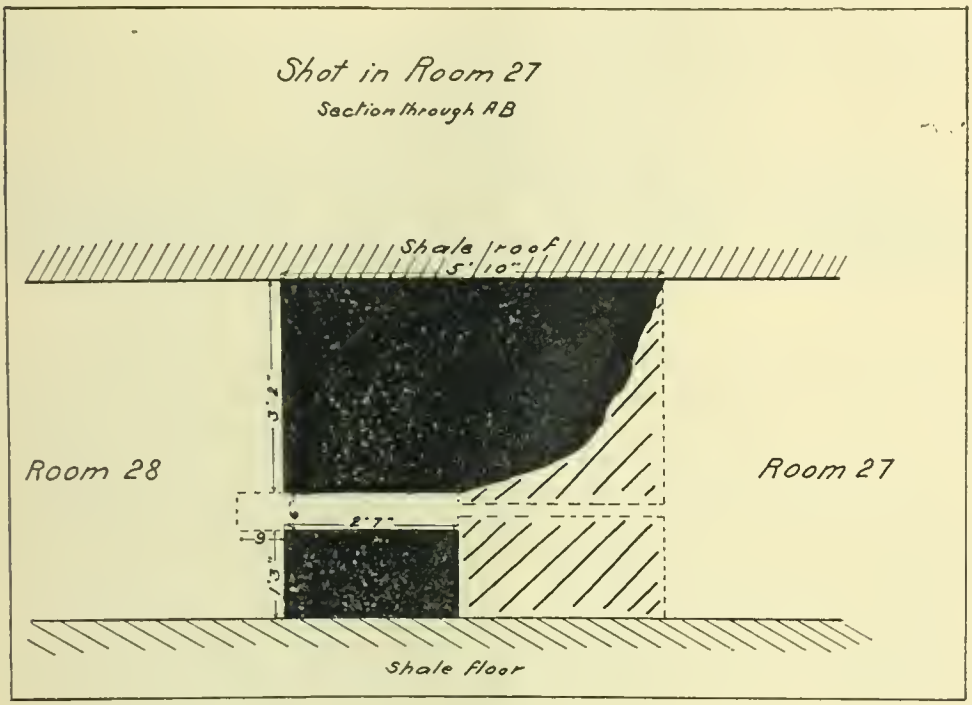
The fact remains that the presence of this chambered portion of the shot referred to has escaped the scrutiny of all the examiners, but if the theory advanced is correct, it might be possible that the cave in room 27 would, in falling, hurl some debris violently to the face and thus obscure the actual opening of the chambered portion of the shot.

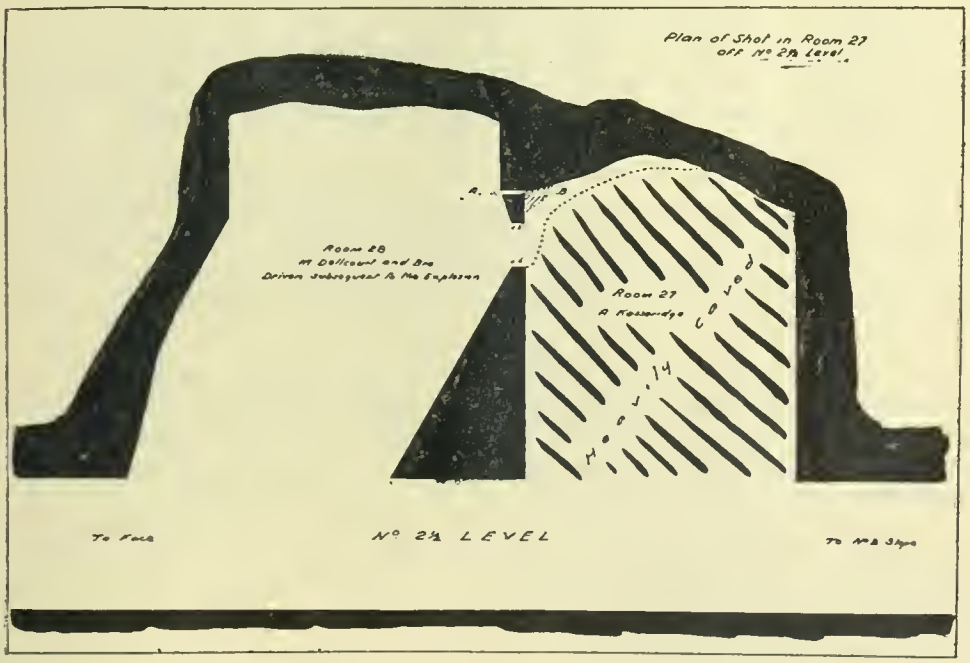
The question which will naturally arise is that if this shot was fired immediately preceding the explosion, why was the report not heard by some of the survivors in the most adjacent workings off No. 4 West level? The apparent answer to this question would be that the distance from the shot to the nearest survivor—Paul Wranovich—who was near the face of room 10, off No. 4 West level, is over 600 feet, and from the shot to the only other near survivor—Hillis Coulter—who was working in a crosscut off the west side of No. 11 room, No. 4 West level, the distance is about 700 feet, and in both cases several right-angle turns intervene, and therefore the shot might not for these reasons have been heard by either of these miners.

The direction of force, as indicated in my previous report, remains in accord with results which would accrue from the foregoing recently discovered evidence.

I have, etc.,

FRANCIS H. SHEPHERD.


Shot in Room 27
Section through AB
Shale roof
5'10"
3'2"
Room 28
Room 27
2'7"
9"
3'3"
Shale Floor


Plan of Shot in Room 27
off No 2½ Level
A
B
Room 28
N Dellcourt and Bro
Driven Subsequent to the Explosion
Room 27
A Kassandra
To Face
No 2½ LEVEL
To No 3 Shaft

INSPECTION OF COAL AND METALLIFEROUS MINES.

:o:

REPORT OF FRANCIS H. SHEPHERD, CHIEF INSPECTOR OF MINES.

I have the honour to submit my first Annual Report as Chief Inspector of Coal and Metalliferous Mines. The Reports of the District Inspectors covering the production of coal and coke, number of employees, and tabulated list of accidents, etc., are hereto appended, and I beg to submit, under separate heads, such subjects as may be pertinent to the Report.

ACCIDENTS.

I regret to state that the total number of accidents was large, the list of single or isolated fatalities being augmented by an explosion which took place at about 8.45 A.M. on October 5th, 1909, in the No. 2 West mine of the Extension Colliery, owned and operated by the Wellington Collieries Company, whereby thirty-two lives were lost.

A very exhaustive inquiry was held to endeavour to ascertain, if possible, the cause of the disaster, and the Provincial Mineralogist, Mr. W. Fleet Robertson, Mr. James Ashworth, M. E., and the writer were instructed by the Honourable the Minister of Mines to make independent examinations and reports.

The mine was worked with naked lights, and no explosive gas had been reported in No. 2 West mine more recently than August 14th, or fifty-two days previously. The mine was universally damp, and therefore there were no dangerous accumulations of dust in the roadways; it is very probable that there was dust in suspension in the working zone, due to the process of mining and loading coal, and sufficient in quantity to act as a contributing agent in the region contiguous to the working faces.

The mine had that morning been working about one hour and a half, so that it may be taken for granted that every man had reached his working place and was employed at his usual task. The inference, therefore, is that there was no body of standing gas, nor had there been any standing reported later than August 14th.

A certain portion of this mine, on No. 2½ level, had previously given off gas freely, and that portion of the mine had been, at that time, worked with safety-lamps and blasting precautions taken, but this condition had passed and naked lights were again installed. The portion of the mine referred to lay through about 550 feet of faulty ground, due to a change of dip and consequent flexure of the measures, resulting in a "roll" which rendered the coal friable.

On the morning of the explosion, and probably immediately preceding it, the coal in the roll lying about the timbers caved for a distance of 515 feet, separated in the centre of this distance by 36 feet which did not cave; the theory advanced is that the compression caused by this cave rendered an atmosphere containing a low percentage of marsh-gas, which under ordinary conditions, and in the *absence of undue concussion*, would not be considered especially dangerous from other causes, explosive in the tight or compressive portions of the mine, and this, added to the probable dust contiguous to the working faces, completed the conditions necessary to an explosion. The explosion was one of low intensity, as was evidenced by the absence of any other cave of any magnitude, there being four or five small caves of about five or six mine-cars full of fallen material each, and these in all cases at points where rooms had been turned off the level and where defective roof might be reasonably expected.

There can be no doubt but that the mine atmosphere contained a low percentage of marsh-gas on the morning of the explosion. The fireman's evidence was that the flame of a Wolf safety-lamp failed to show a "cap" and the only indication was a mere "scum," a phrase used by firemen to indicate a "dirty" condition of the atmosphere and generally indicating the presence of some marsh-gas, but of a percentage below that indicated by a distinct "cap."

The gaseous condition of the mine atmosphere noticed during the days of the examination and exploration, subsequent to the explosion, was due in a great measure to increased temperature and the dynamic energy evolved by the explosion; the latter quantity, though low, would still contribute to the liberation of occluded gases. This condition is noticeable in all explosions of gaseous mines, especially where the dynamic energy has been great and the temperature high. This was noticeable at Cumberland and Fernie. At the former explosion the return air at the fan continued to issue in an explosive condition for days, and this in a mine which had been worked with naked lights up to the time of the explosion.

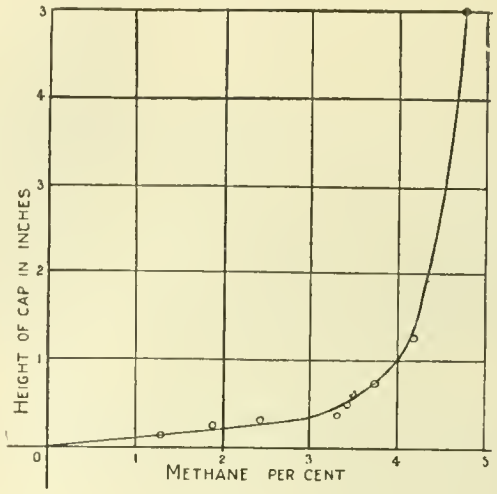
On November 6th, at my final examination of the No. 2 West mine, and prior to granting permission to recommence operations, the percentage of marsh-gas in the main return from the exploded district was 1 per cent.

The verdict of the jury was as follows: "We, the jury empanelled to inquire into the cause of the explosion which took place in No. 2, Extension mine, on October 5th, 1909, have come to the conclusion, after investigating the evidence of the different sworn witnesses, that the explosion was caused by the cave in No. 2½ level. Gas being present in the atmosphere, gas and dust being liberated by the cave, the sudden displacement of air creating the compression, causing the partly charged atmosphere to become dangerous, and coming in contact with naked lights, exploded. Taking into consideration the unnatural and faulty conditions of the roof of this particular cave, and in view of the fact of no evidence to show of bad timbering, we can in no way hold the company responsible, and therefore exonerate the company from criminal negligence."

The deduction to be drawn from the investigation is that dangerous conditions may exist in the mine atmosphere, even when the flame of the fireman's safety-lamp fails to indicate the presence of marsh-gas. A "scum" may be due to the presence of methane or marsh-gas, or it may be due to the product of the illuminant. In the Report of the Royal Commission on Mines, page 73 (Second Report), referring to the method of detecting the presence of fire-damp in the air-current by the "cap" on the flame of the safety-lamp, the following deduction from a series of careful experiments appears :—

"To see the cap clearly, the flame must be pulled down until only a blue non-luminous flame is left. Widely divergent statements are current, and have been quoted by witnesses who have appeared before us, as to the proportion of fire-damp which can be detected by an ordinary safety-lamp. In order to obtain conclusive evidence on the point, a series of careful experiments were carried out by Mr. Cadman, who observed the 'caps' shown with ordinary safety-lamps and oil such as are in common use, in mixtures of fire-damp and air, where the proportion was determined by analyses, usually on the spot. The result of these experiments are given in his report, and his conclusion is that anything exceeding 1 per cent. of fire-damp can be readily detected with an ordinary safety-lamp, although a completely formed 'cap' is not seen until *2 per cent. of fire-damp is present.* A practised observer can detect even smaller percentages, particularly if pure colza-oil and a magnifying-glass are used."

This deduction is practically confirmed by a Report submitted to the Royal Commission by the Scottish mine-owners on the relation of the "cap" on the flame of the safety-lamp to the proportion of fire-damp in the atmosphere, and who submit a diagram (page 236, Second Report) which shows graphically the relation between the percentage of methane and the height of the "cap."



Adding: "It will be evident that an estimation of small proportions of methane which is based only on the size of the 'cap' *must be uncertain.*" It is very necessary, therefore, that some practical appliance should be placed in the hands of the fireman which will determine low percentages of fire-damp in the air-current and which will not entail inconvenient, or complicated, methods of observation.

Good results seem to be obtained by a device designed by Mr. Henry Cunynghame and Mr. John Cadman, and fully described in the "Colliery Guardian" of October 15th, 1909, page 774, which simply consists of a strip of asbestos moistened with a strong solution of carbonate of soda, to which is added a few drops of hydrochloric acid, and applied to the flame of the safety-lamp by some easily designed method.

One-half per cent. of gas in the atmosphere shows a well-formed triangular cap, while 1 per cent. shows a cap of 1 inch or the equivalent of 4 per cent. on the ordinary flame of the safety-lamp. Colour of the cap is orange and easily distinguishable in the presence of a bright light. It is to be hoped that the device will prove practically successful.

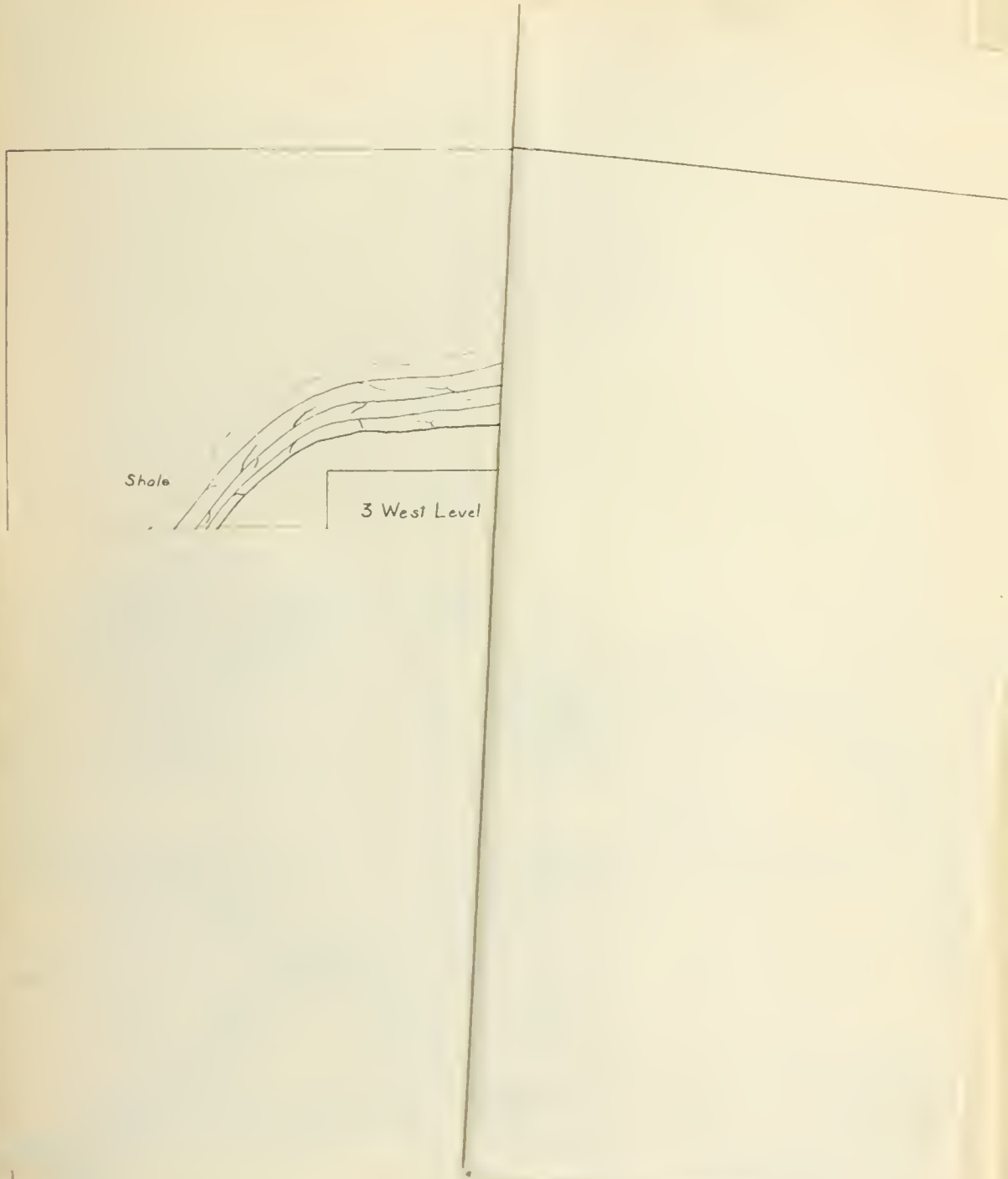
Another important factor is the fireman's physical ability to detect the cap. It is asserted that only 25 per cent. of a number of miners who were examined for physical defect, as affecting their ability to detect the cap, were free from nystagmus in some degree, and it would seem to be necessary to safety that firemen and other officials should undergo some examination in this regard.

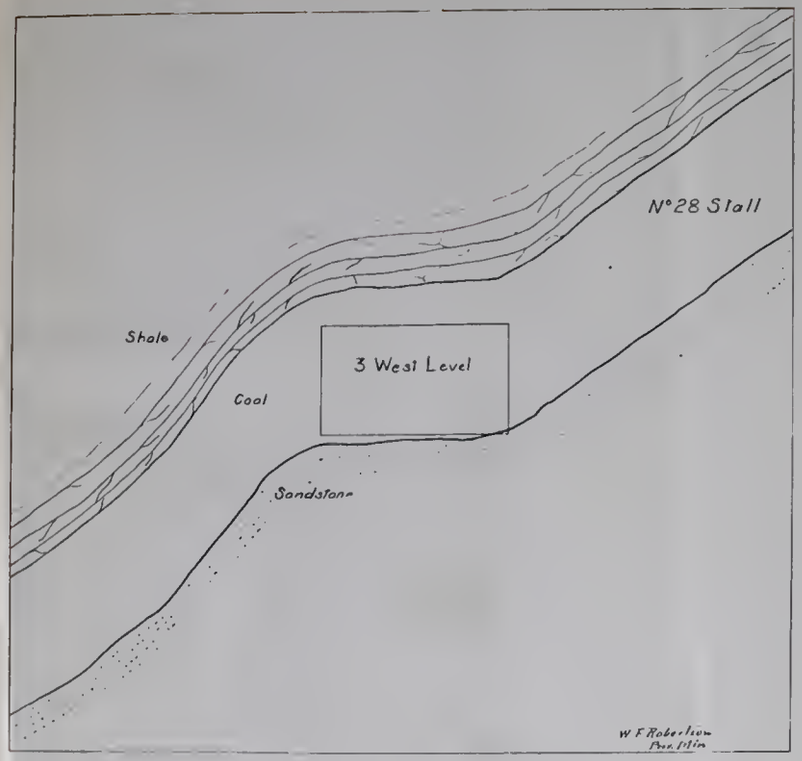
Outbursts of Gas at Carbonado Colliery.

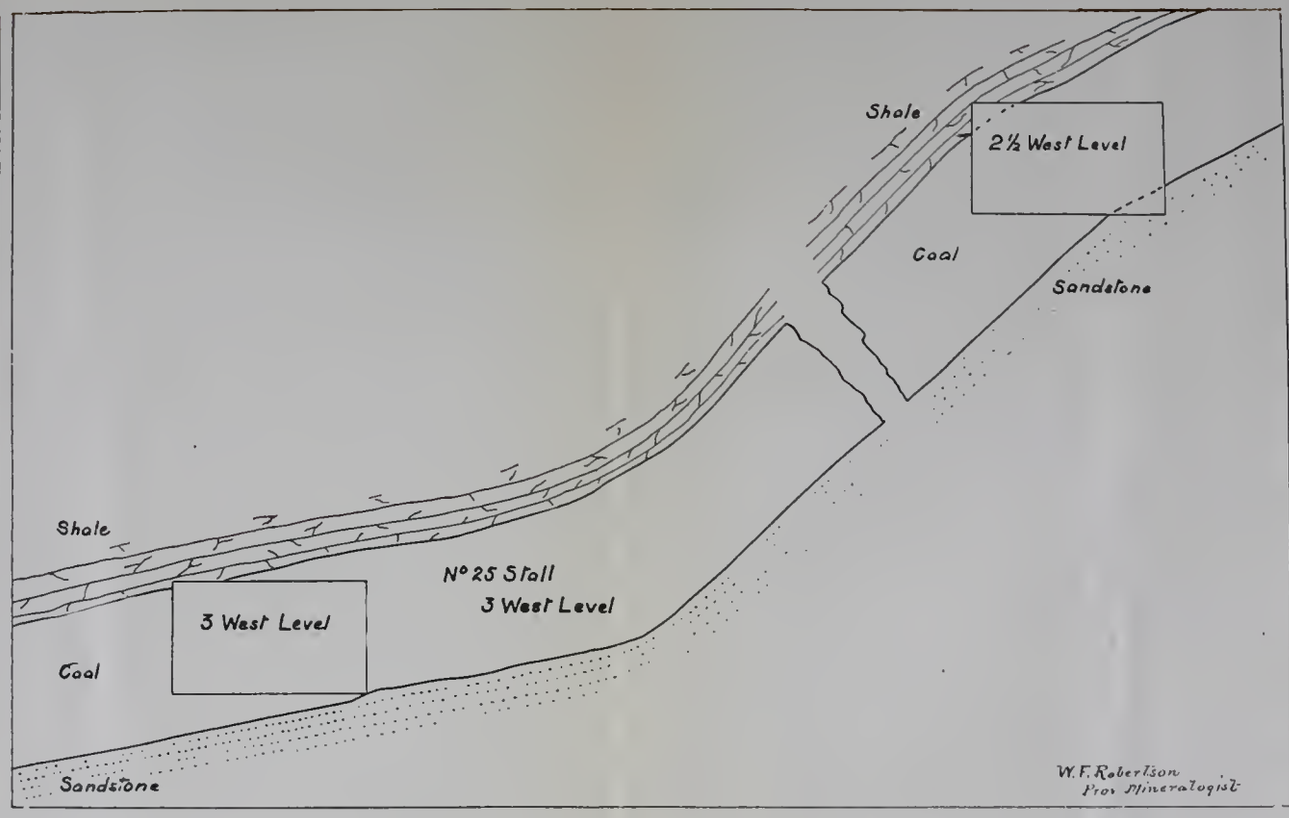
There were three outbursts of gas in the early part of the year, all of which occurred in the Crow's Nest Pass Coal Co.'s No. 7 mine at Carbonado.

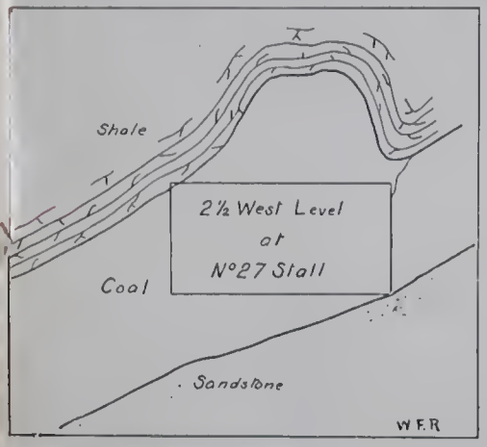
Outburst of Gas of January 27th, 1909.

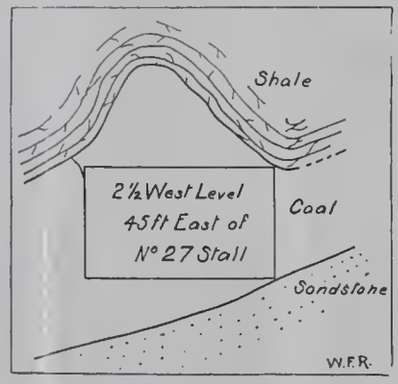
This occurred in the top coal in the face of the main level and filled the level with coal for 15 feet. The men in the level heard the coal breaking overhead, and were enabled to retreat to the mouth of the mine—several hundred feet away—in safety. In fifteen minutes from the time of the outburst, the gas issued from the mouth of the mine, so pure as to extinguish the flame of a safety-lamp, 30 feet outside the tunnel. A remarkable instance was that a horse which the driver had abandoned in his flight was found alive one hour afterwards. The ventilation fan is on the outcrop, and is a forcing fan, and as soon as the outburst was reported was put on full speed. As the main level and counter are the winning

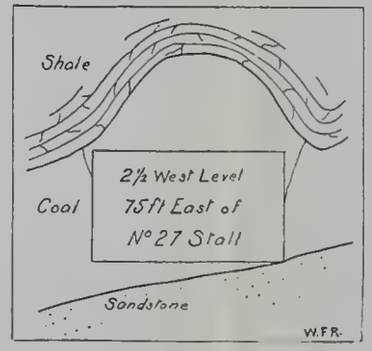

Shale
3 West Level

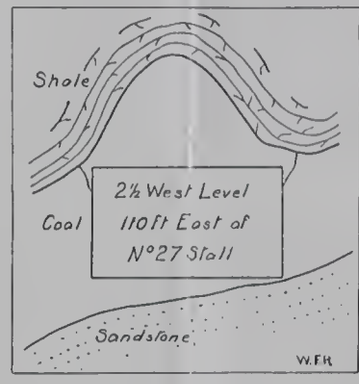

N°28 Stall
Shale
3 West Level
Coal
Sandstone
W F Robertson
Prov Mineralogist

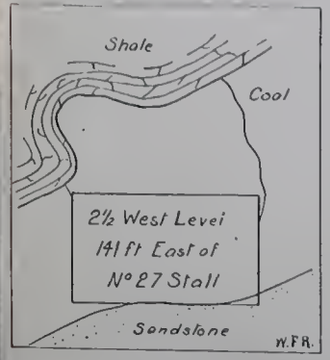

Shale
2½ West Level
Coal
Sandstone
Shale
N°25 Stall
3 West Level
3 West Level
Coal
Sandstone
W. F. Robertson
Prov Mineralogist

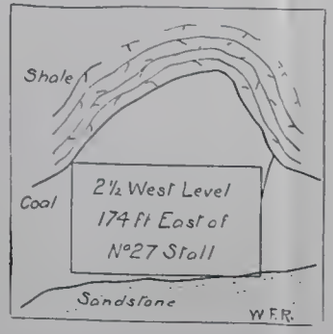

Shale
2½ West Level
at
N°27 Stall
Coal
Sandstone
W.F.R

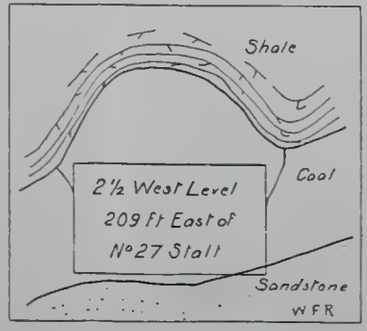

Shale
2½ West Level
45 ft East of
N°27 Stall
Coal
Sandstone
W.F.R.

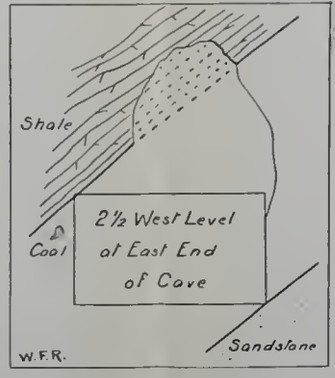

Shale
2½ West Level
75 ft East of
N°27 Stall
Coal
Sandstone
W.F.R.

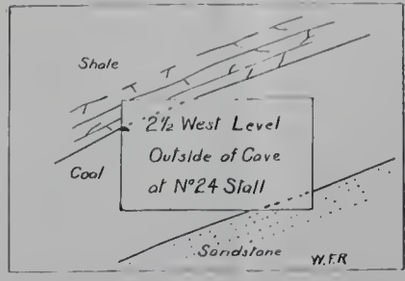

Shale
2½ West Level
110 ft East of
N°27 Stall
Coal
Sandstone
W.F.R


Shale
Cool
2½ West Level
141 ft East of
N°27 Stall
Sandstone
W.F.R.

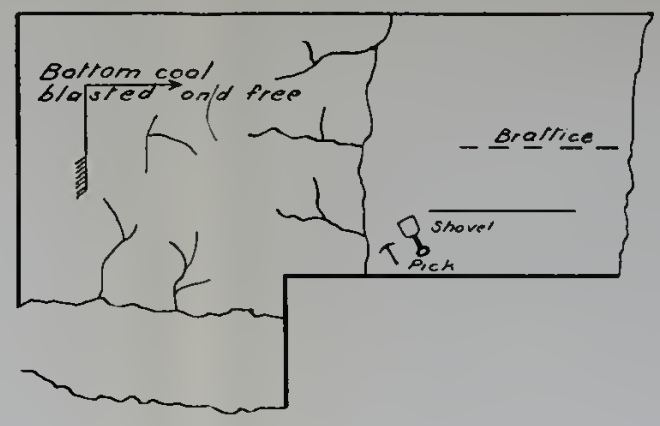

Shale
Coal
2½ West Level
174 ft East of
N°27 Stall
Sandstone
W.F.R.


Shale
Coal
2½ West Level
209 ft East of
N°27 Stall
Sandstone
W.F.R

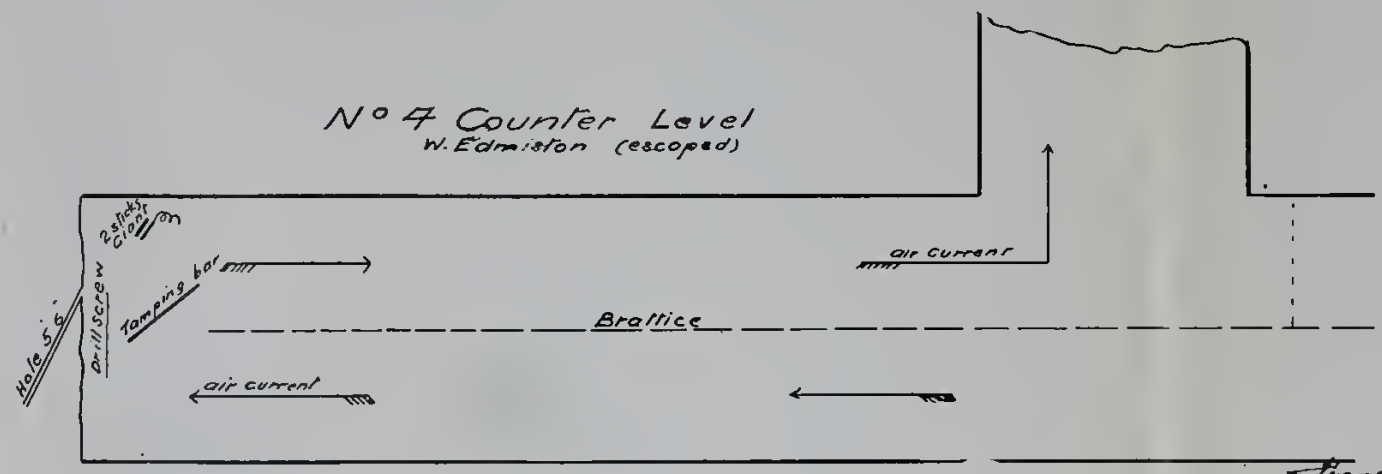

Shale
Coal
2½ West Level
at East End
of Cave
W.F.R.
Sandstone


Shale
2½ West Level
Outside of Cave
at N°24 Stall
Coal
Sandstone
W.F.R

Face of N° 4 West Level
D. Irwin (escaped)

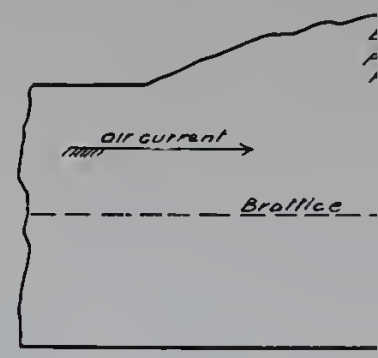


N° 4 Counter Level
W. Edmiston (escaped)

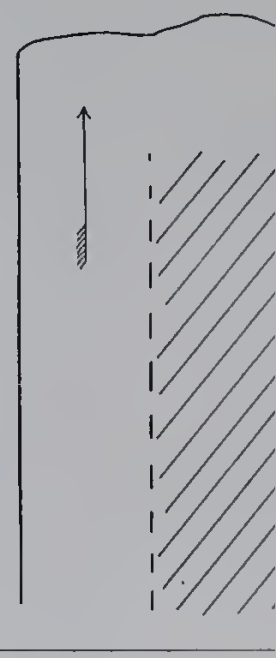


Thomas H Shepherd
Chief Inspector of Mines

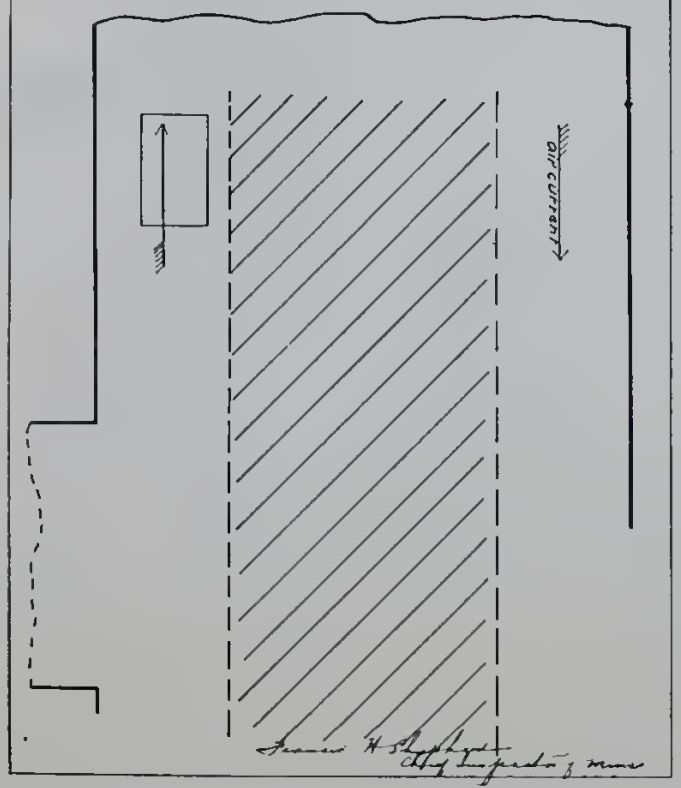
Alex
Room
Lost. His body w
Room N°



Room N° 1
O Radford -(e

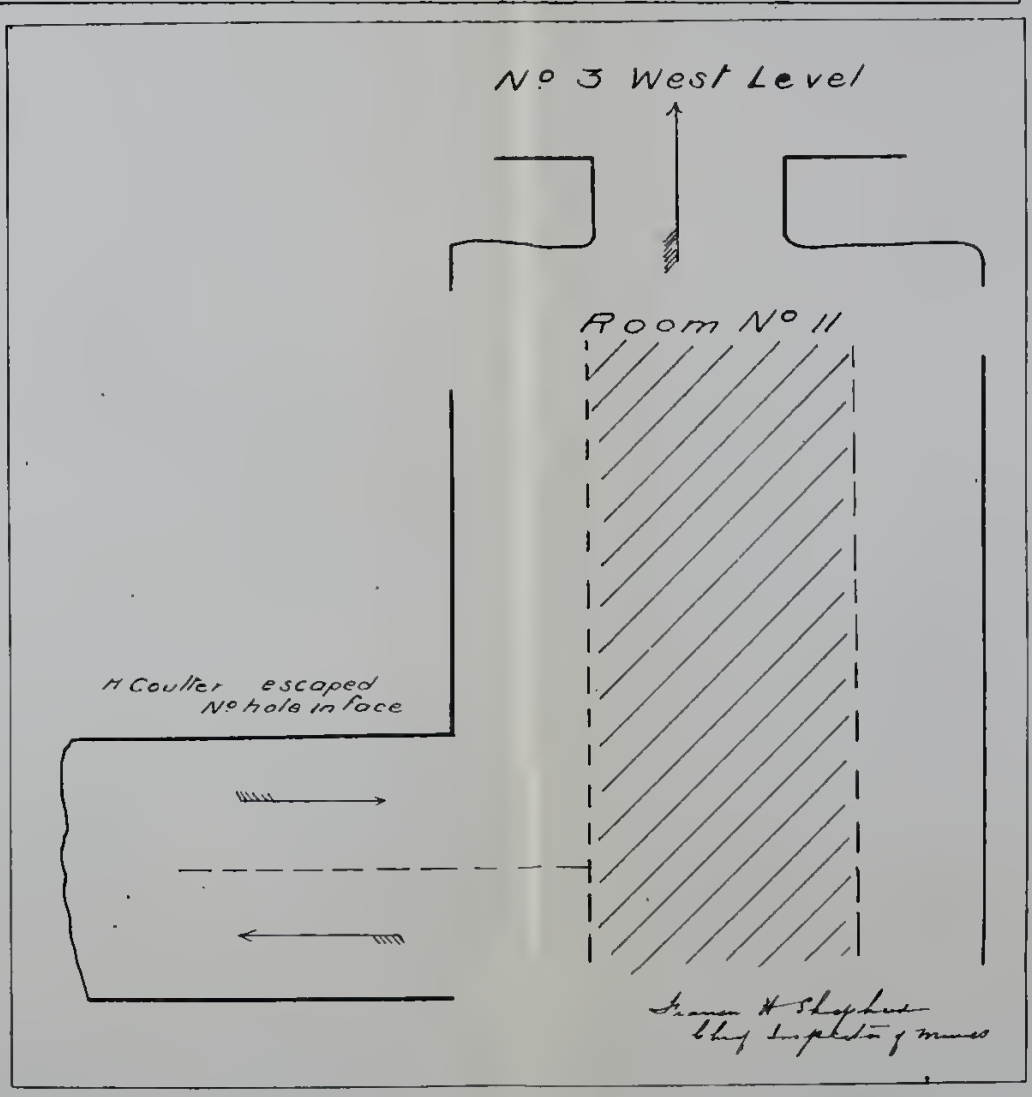


Room N° 12
a Dewar escaped
No hole in face



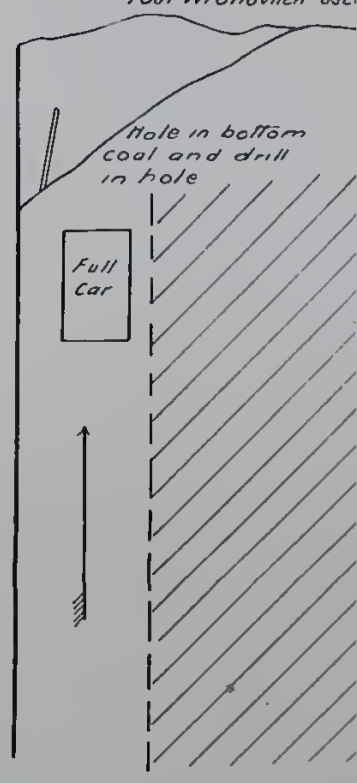
Thomas H Shepherd
Chief Inspector of Mines

N° 3 West Level

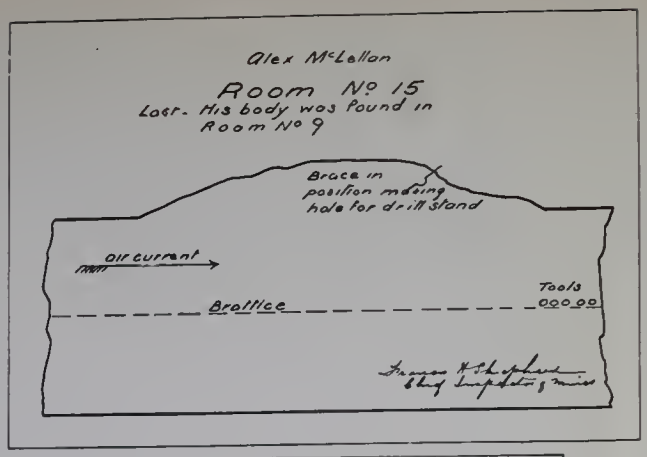


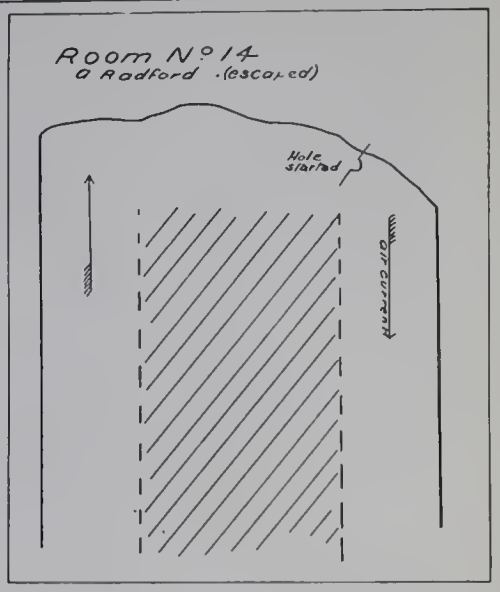
Thomas H Shepherd
Chief Inspector of Mines

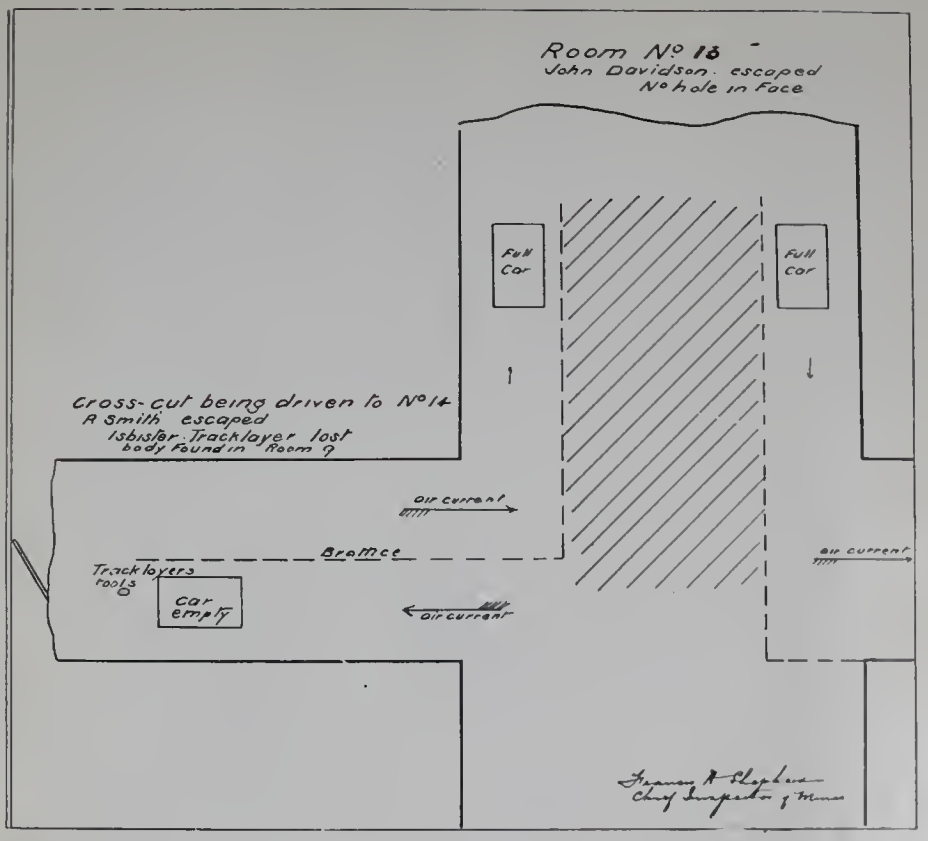
Room N°
A White los
Poul Wronovitch esc

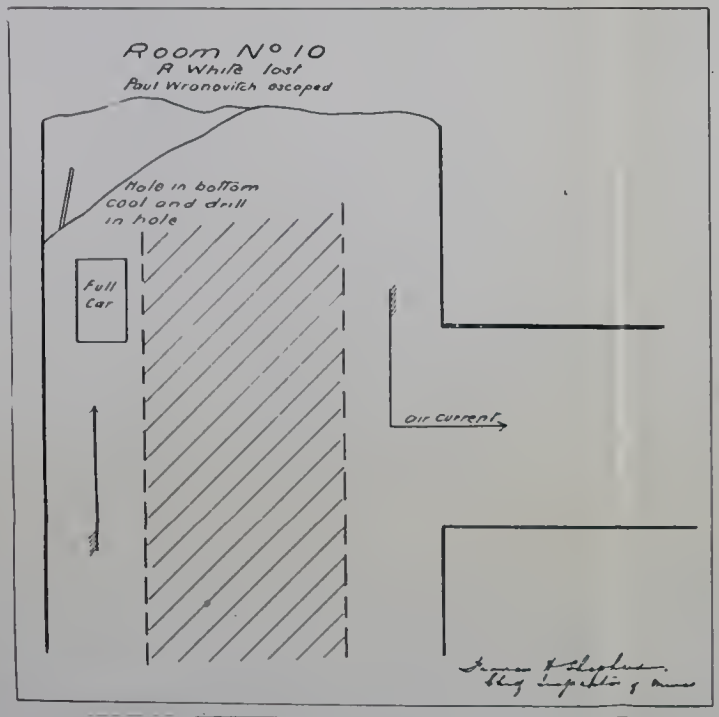


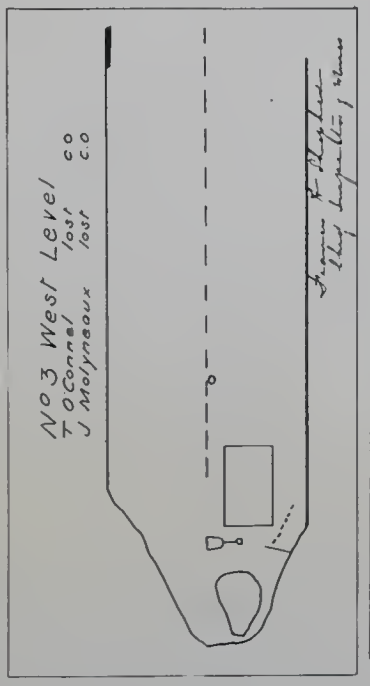
FEET.

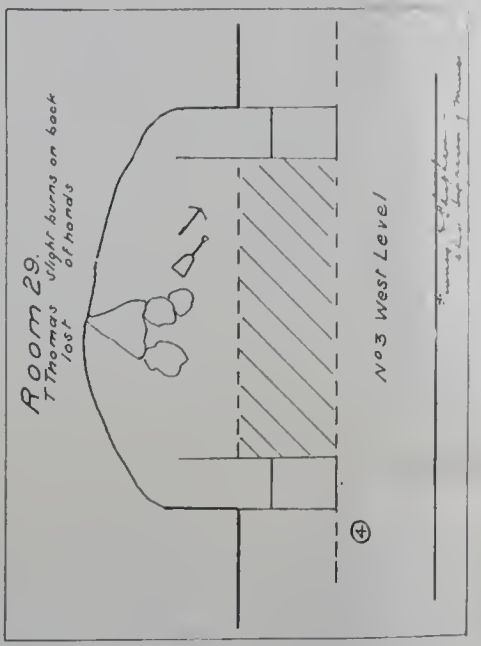

Alex McLellan
Room No 15
Lost. His body was found in Room No 9
Brace in position making hole for drill stand
air current
Brattice
Tools
Thomas H. Hughes
Chief Inspector of Mines


Room No 14
A Radford (escaped)
Hole started
air current

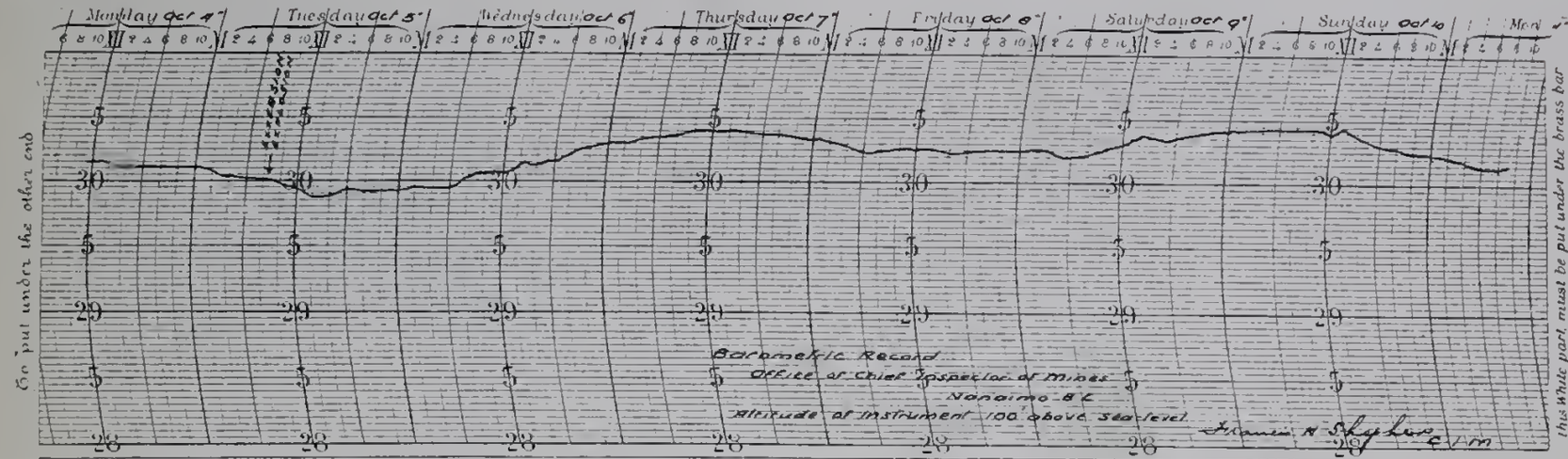

Room No 13
John Davidson escaped
No hole in Face
Full Car
Full Car
Cross-cut being driven to No 14
A Smith escaped
Isbister Tracklayer lost
body found in Room 9
air current
Brattice
air current
Track layers tools
car empty
air current
Thomas H. Hughes
Chief Inspector of Mines

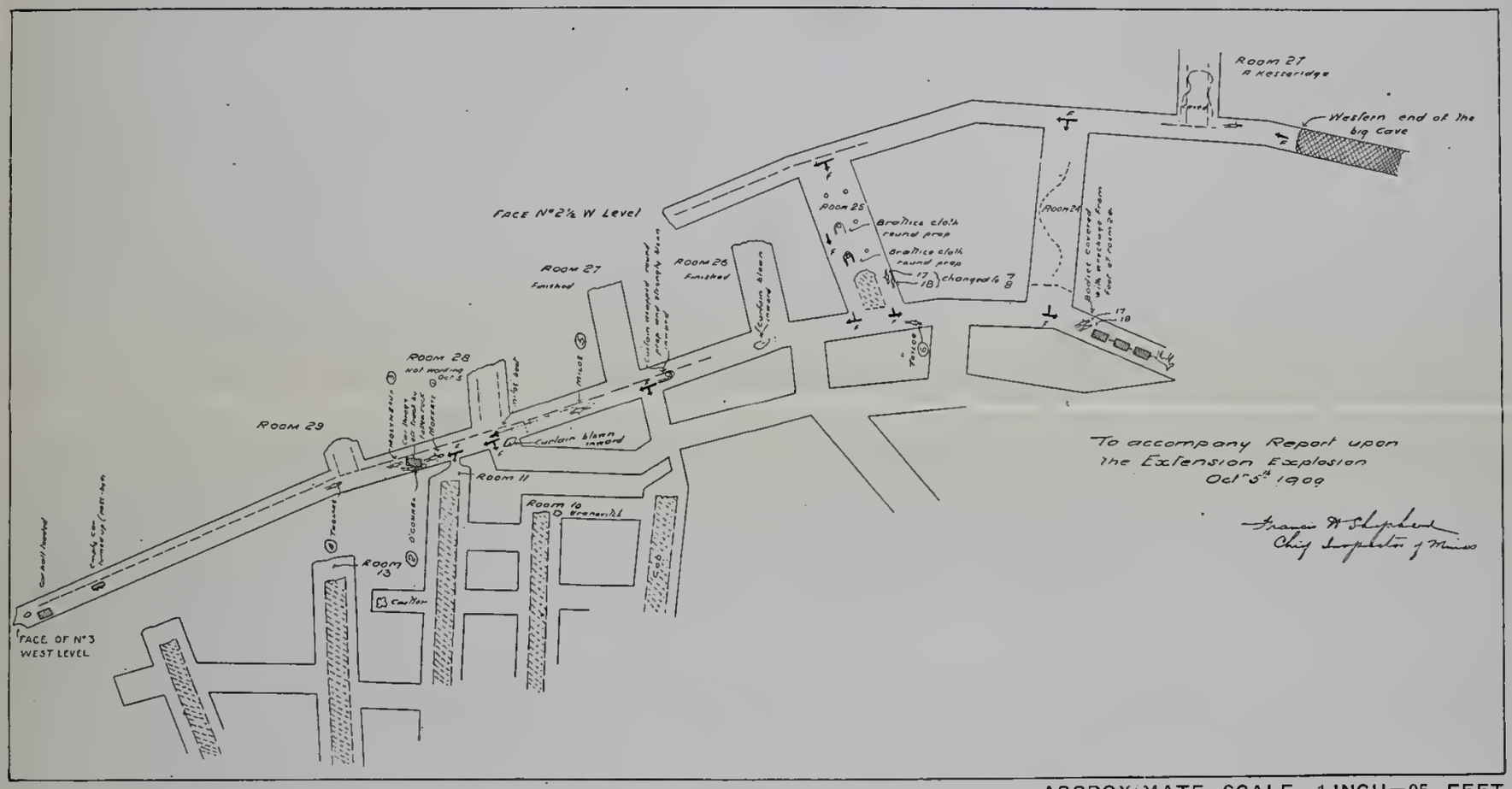

Room No 10
R White lost
Paul Wronovitch escaped
Hole in bottom coal and drill in hole
Full Car
air current
Thomas H. Hughes
Chief Inspector of Mines


No 3 West Level
T O'Connel lost c.o
J Molyneaux lost c.o
Thomas H. Hughes
Chief Inspector of Mines

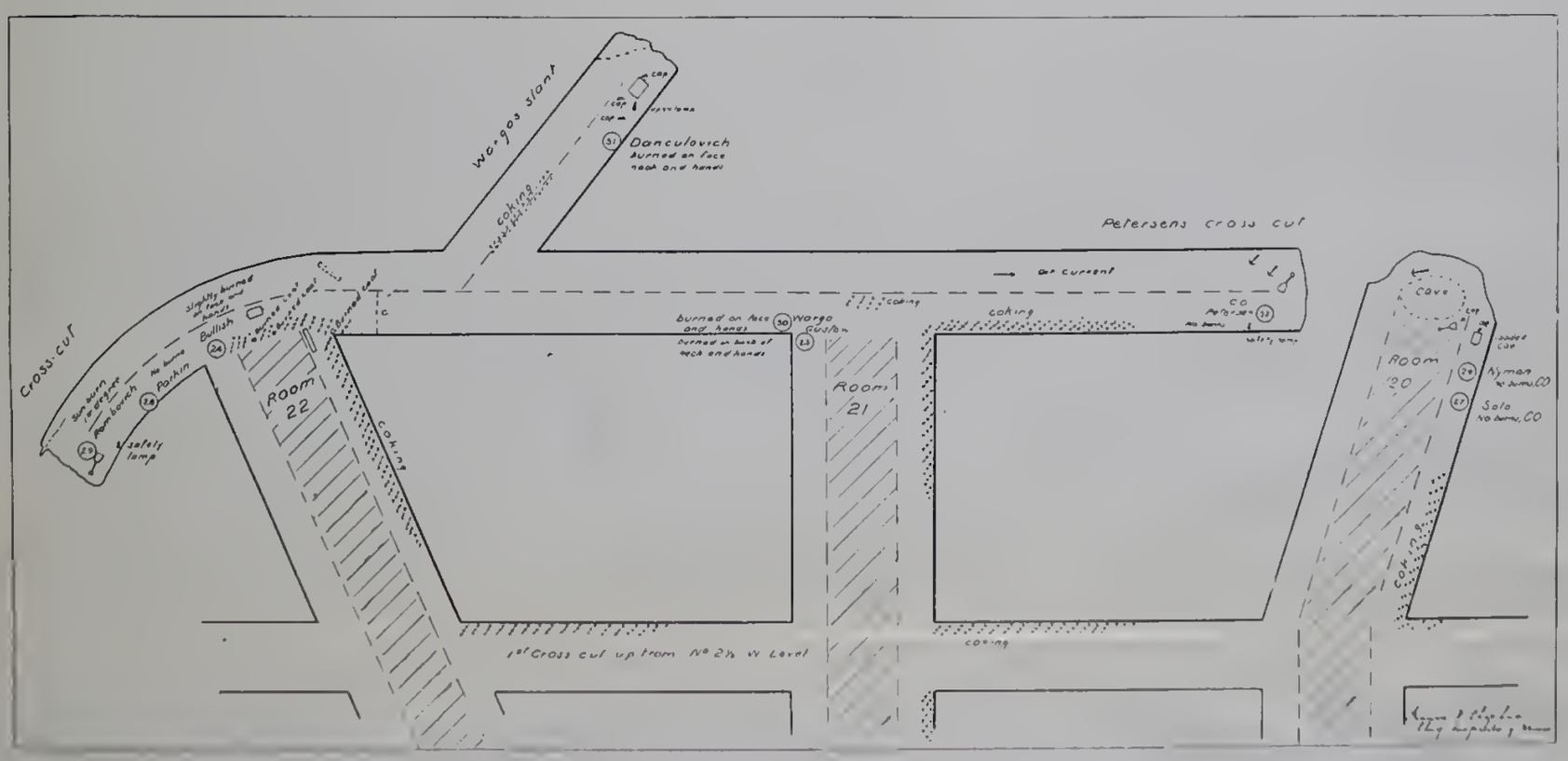

Room 29
T Thomas slight burns on back
lost of hands
No 3 West Level
Thomas H. Hughes
Chief Inspector of Mines

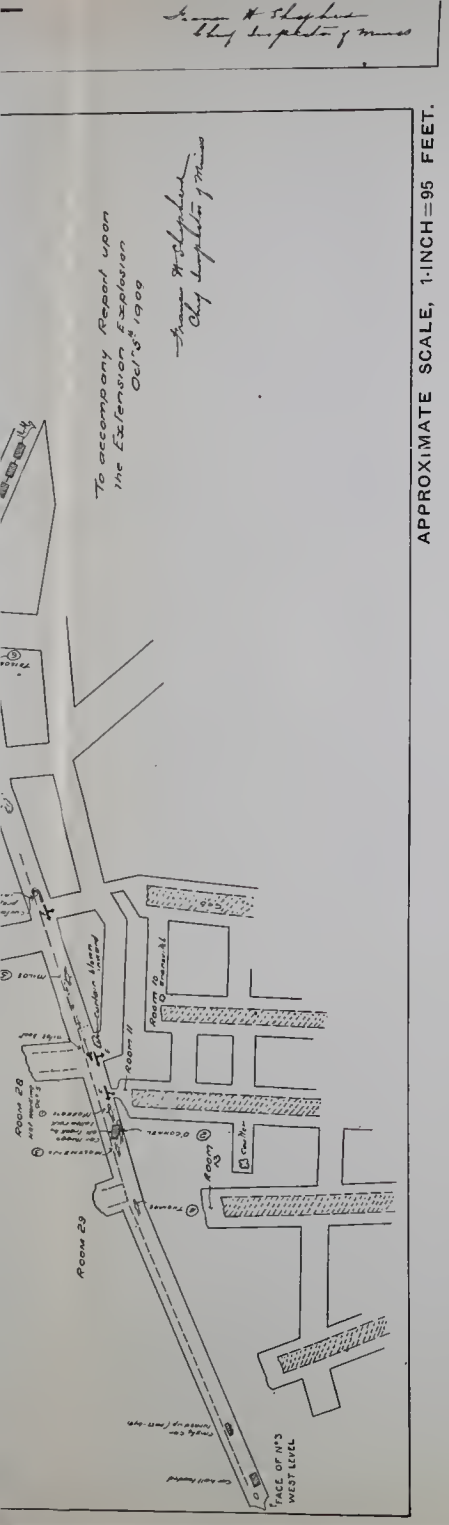
=95 FEET.

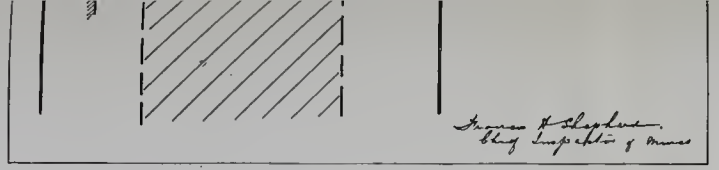


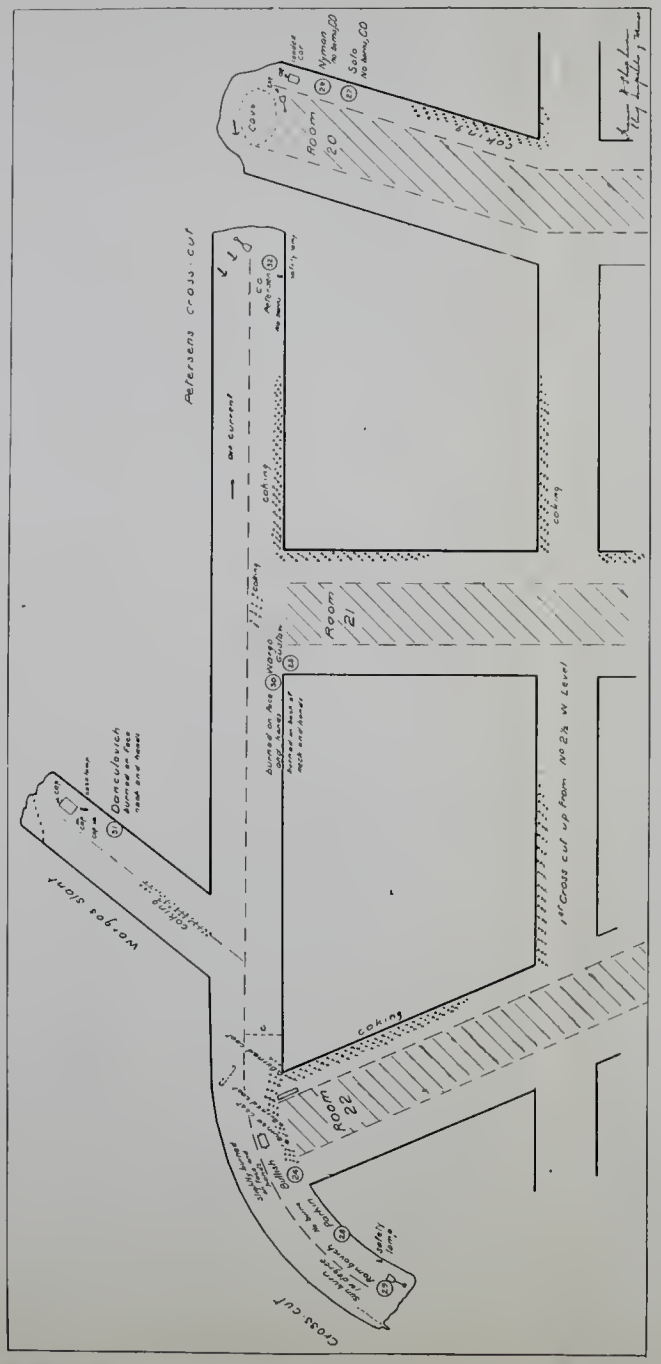


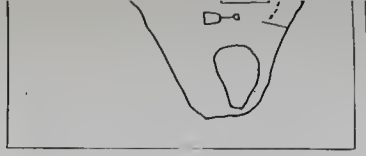
APPROXIMATE SCALE, 1-INCH=95 FEET.

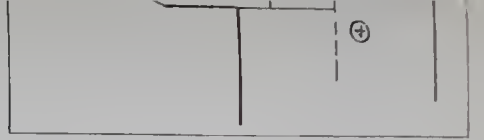


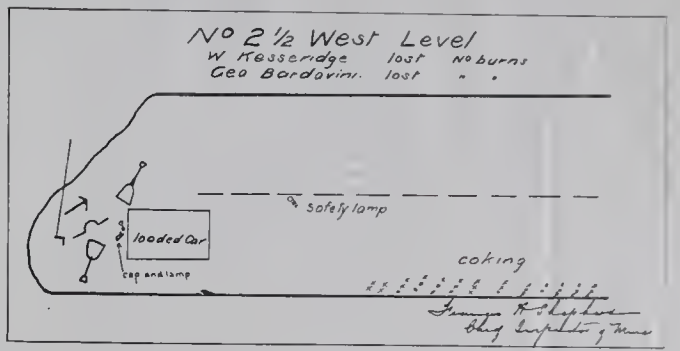

To accompany Report upon the Extension Explosion Oct 13th 1909
APPROXIMATE SCALE, 1-INCH=95 FEET.
Room 29
Room 28
Room 23
Room 11
Room 10
FACE OF No 3 WEST LEVEL

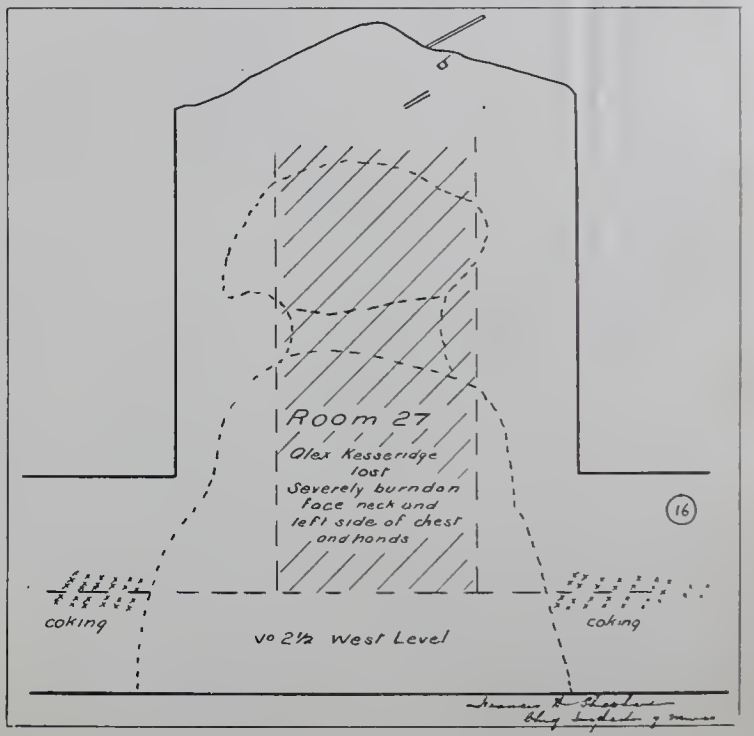



Room 20
Room 21
Room 22
Petersens cross cut
Cross cut
1st Cross cut up from No 2½ W Level
Working sight
Coking
Dan current

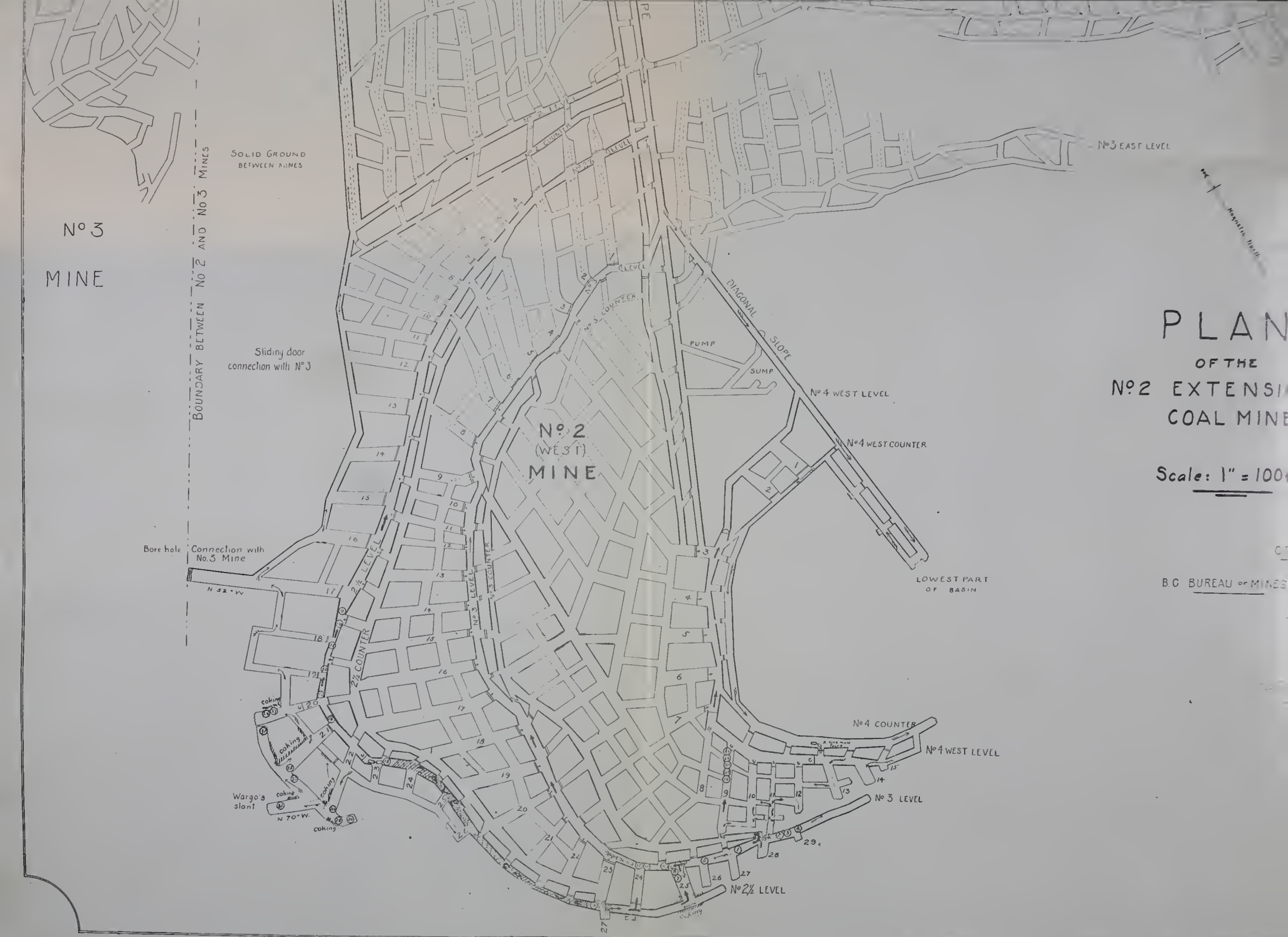


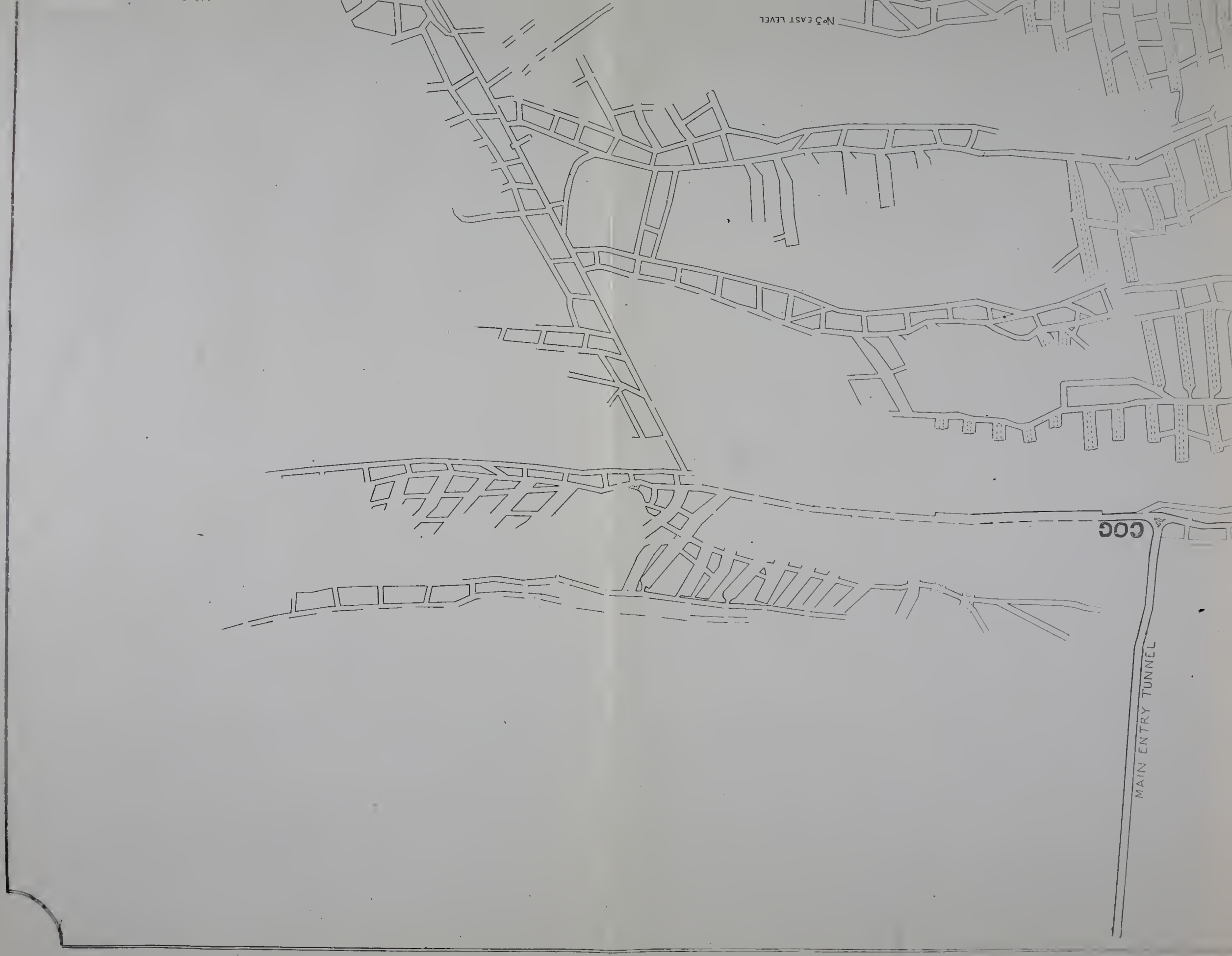


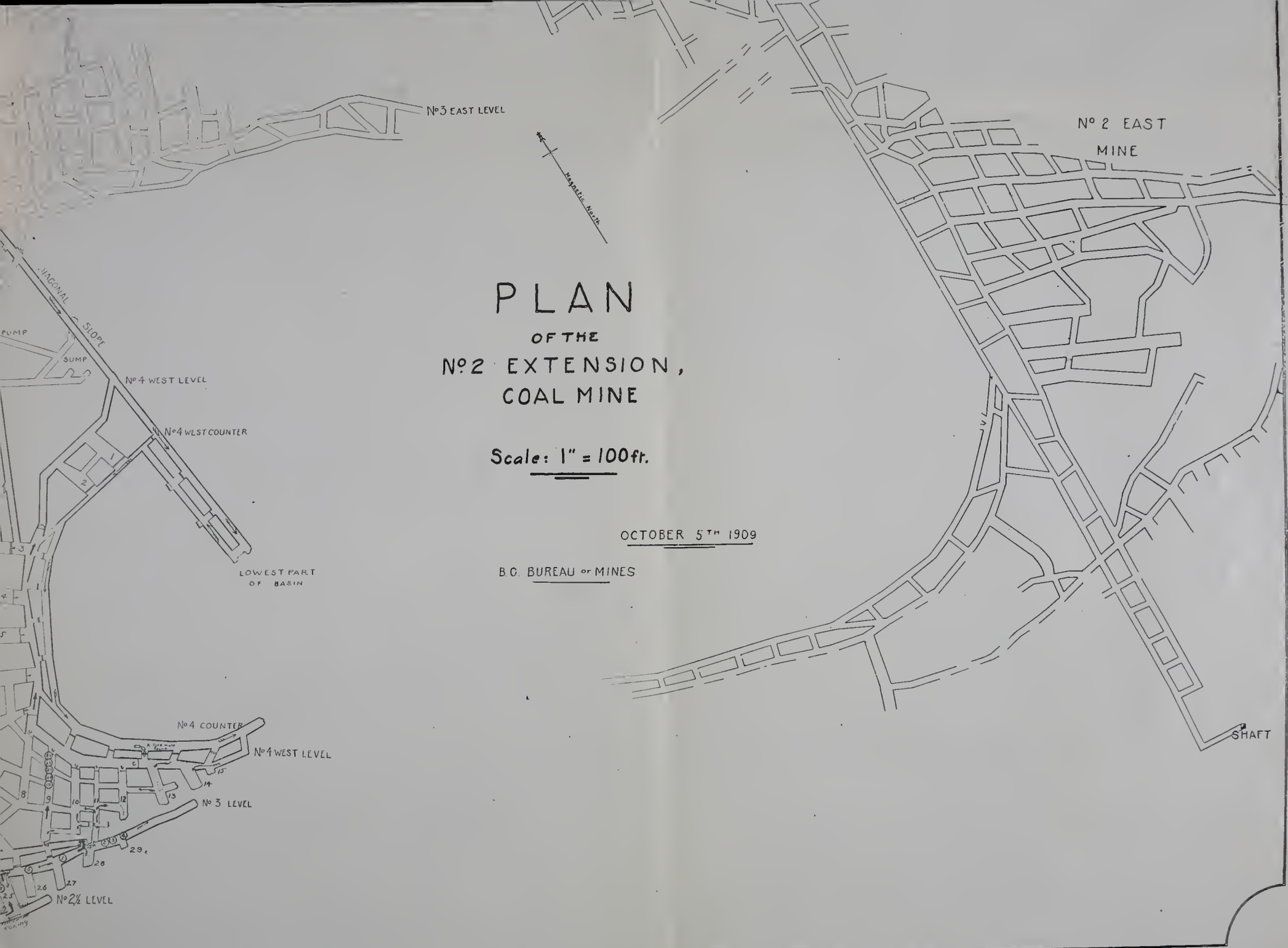

No 2½ West Level
W Kesseridge lost No burns
Geo Bardovini. lost " "
safety lamp
loaded car
cap and lamp
coking


Room 27
Olex Kesseridge lost
Severely burndon face neck und left side of chest and hands
16
coking
coking
No 2½ West Level

To Fan at Surface
Main Entry Tunnel
COG
Motor Road to No 3 Mine
Stalls being put through
No 2 Slope
No 3 East Level
Solid Ground between Mines


No 3
MINE
BOUNDARY BETWEEN No 2 AND No 3 MINES
SOLID GROUND BETWEEN MINES
Sliding door connection with No 3
No 2
(WEST)
MINE
No 3 EAST LEVEL
DIAGONAL SLOPE
PUMP
SUMP
No 4 WEST LEVEL
No 4 WEST COUNTER
LOWEST PART OF BASIN
Bore hole
Connection with No 3 Mine
N 32° W
2½ LEVEL
2½ COUNTER
No 3 LEVEL
No 3 COUNTER
No 4 COUNTER
No 4 WEST LEVEL
No 3 LEVEL
No 2½ LEVEL
Wargo's slant
N 70° W.
coking
PLAN
OF THE
No 2 EXTENSI
COAL MINE
Scale: 1" = 100
B.C. BUREAU OF MINES


No 3 EAST LEVEL
500
MAIN ENTRY TUNNEL



PLAN

OF THE

No 2 EXTENSION,

COAL MINE

Scale: 1" = 100 ft.

OCTOBER 5TH 1909

B.C. BUREAU OF MINES

drivages, and the points most likely to encounter these outbursts, the deduction would be that, in the interest of safety to the greatest number, these drivages should only be worked when the remainder of the mine is not working. This arrangement was made accordingly.

Outburst of May 5th, 1909.

An outburst occurred in a crosscut 12 feet back from the face of the main level, whereby two miners, Joe Kubei and John Planetta, lost their lives. The crosscut was up about 20 or 25 feet, the seam pitching about 75 degrees. The outburst occurred in the face of the crosscut, and the place of issue appeared to be up through the floor of bottom coal, and the force brought down from the face about 20 tons of coal. It could not be determined whether the men had been killed by the falling coal or caught and suffocated by the gas. The gas filled the main level for a considerable distance out, but did not prevent the recovery of the bodies immediately afterwards.

Outburst of May 19th, 1909.

The main level had been driven about 14 feet from the position obtaining at the previous outbreak on May 5th. An outburst occurred in the extreme face of the level which blew out, from directly up the pitch, a hole about 25 feet high and 8 feet in diameter. Fortunately, no lives were lost. The gas issued from the mouth of the mine for six hours, and it is estimated that 750,000 cubic feet of marsh-gas was given off during that time. The gas issued from the mouth of the mine 1,700 feet from the face of the level in an explosive condition. The remarkable feature is that this outburst should occur about 30 feet only from the outburst of May 5th, especially as the coal is somewhat friable. The general experience has been that an outburst would secure immunity for some time, or distance. No work has been done in this mine since this outburst, and all the Carbonado mines have since been closed.

The question of dealing with these outbursts is the most important and the most difficult problem to cope with in this field. If this portion of the field is to be worked at all, it must be under conditions which will give the miner some chance for his life. Most of the outbursts in this field have been attended with loss of life. The whole question devolves upon the possibility of relieving the pressure ahead of the working face. If this cannot be done, it would be inhuman to ask or allow a miner to take chances such as are not experienced in any other industry. If the field is valuable, and this may be readily conceded, it would appear that the operators could go to considerable expense in experimental work, having for its object the safe winning of the field and the protection of the lives of those who may engage in its development, and it would be a reproach to modern science and engineering skill to admit that the problem will not admit of a reasonably safe solution.

Reconsolidation and Amendment of the "Coal Mines Regulation Act."

During the recent session of the Legislature, a proposed consolidation and amendment of the "Coal Mines Regulation Act" was submitted to the House, but as the matter was of such importance, and in order to give both the operators and the employees an opportunity to consider the changes proposed, the Honourable the Minister of Mines decided to allow the Bill to stand over until the next session, and that a proposed new Bill should be drafted and submitted accordingly.

It should be stated that the present "Coal Mines Regulation Act" is largely copied from the old British "Coal Mines Regulation Act," and amendments have been made from time to time with a view of making it conform somewhat to the conditions prevailing in the Province. The salient features requiring revision and amendments are briefly as follows:—

Age Limit of Employees.—This requires amending to conform with our educational laws, and the minimum age of fifteen years is suggested.

The Eight-hour Clause.—Amendments are needed to make this effective and practical in its working. Where certain duties are continuous throughout the twenty-four hours—viz., the duties of pumpmen, stablemen, bottomers, and persons in charge of constantly running machinery underground—some provision should be made to effect a change of shift at the place of duty. In order to enforce the main intent of the eight-hour clause, some such provision is absolutely necessary.

Using One Shaft for Intake and Return Ventilation.—The provisions of the present Act, where two shafts are required by the Act, should be extended to include the purposes of ventilation, as well as for purposes of ingress and egress. The danger of the rapid destruction by fire of the mid-wall or the fan connection needs no further comment.

Plans of Abandoned Mines.—The safety of the workers demands that the fullest information as to the position and extent of contiguous abandoned workings should be made available to the officials who are immediately responsible for the safety of such workers.

Plans of Mines for the Guidance of Employees.—In addition to the plan posted at the mouth of the mine, directing notices should be placed in prominent or needed positions underground.

Ventilation.—Increase in the minimum quantity required by animals in the mine. This is now 100 cubic feet a minute for each horse or mule, and should be increased to at least 300 cubic feet a minute.

Use of Explosives.—Very important amendments are required to be made under this head. It is not necessary that inflammable gas should have been found in a mine within the preceding three months to render it dangerous from the effect of badly planted shots. Low percentages of marsh-gas, not detectable with the ordinary safety-lamp, may render a mine dangerous, and all dry and dusty mines are more or less subject to the dangers arising from blown-out or badly planted shots. There is no mine in the Province which should be exempt from the necessary precautions governing the use of explosives.

Sanitary Arrangements.—Provisions governing sanitary arrangements both on the surface and underground are required, and should be at least as comprehensive as similar provisions in the "Inspection of Metalliferous Mines Act."

Oxygen Life-saving Apparatus.—At the request of the Honourable the Minister of Mines, and in company with the Deputy Minister of Mines, Mr. R. F. Tolmie, I visited the exhibit of the Draeger Oxygen Apparatus Co. at the Alaska-Yukon-Pacific Exposition at Seattle, and made a thorough test of the apparatus in the sulphur chamber. We also at a later date made an examination of the reviving apparatus, which is an auxiliary apparatus to the above. The result of such examinations was highly satisfactory. Subsequently Mr. W. F. Robertson, Provincial Mineralogist, made an examination of the apparatus, and his report to the Honourable the Minister of Mines was also confirmatory. Such appliances should be available in every mine throughout the Province, and in this connection I beg to quote from the recommendations of the jury at the Extension explosion inquest: "(3.) That every colliery in British Columbia be compelled to equip their mines with up-to-date oxygen life-saving apparatus."

Speaking from an experience gained by the explorations of the Cumberland, Fernie, and Extension disasters, I am strongly of the opinion that every colliery should be equipped with sets of the apparatus sufficient in proportion to the number of men employed, and that central supply stations for the training of rescue corps should be maintained by the Government.

Dr. Holmes, the head of the Technologic Department of the U. S. Geological Survey, states that a main central training station is about to be installed at Seattle, and cordially invites the Mines Department of this Province to participate in the advantages to be derived therefrom.

The recovery of twenty or more men from the Cherry mine (Illinois) after being entombed seven days will supply all the needed argument in favour of the early installation of the apparatus.

Briefly, the advantages are: (1.) Life may be saved if the apparatus is reasonably accessible. (2.) The recovery of the mine and the restoration of the ventilation can be expedited, and the chances are in favour of saving life in the remote portions of the mine, where men may have barricaded themselves off in an effort of self-protection. (3.) As a means of reaching both surface and underground fires, the advantages of having such apparatus on the ground are manifold, and would be a good investment from an insurance point alone.

If the saving of one single life can be effected by the installation of the apparatus, and there is evidence that many lives have been saved, there could be no argument against the installation of the apparatus throughout the Province.

In selecting the type of apparatus, uniformity and interchangeability is very desirable, and this is mentioned with a view of reciprocally co-operating with the installations in the State of Washington and the various mines of the Province, should occasion require. As a final argument, I beg to quote the deductions of the Royal Commission on Mines upon the subject:—

"Having regard to the continued development of the apparatus and to the reasonable prospect of its utility in rescue operations, apart from its proved value in case of underground fires and in other respects, we are strongly of opinion that the schemes which we recommended in our First Report for the systematic provision of the apparatus and the training of men in its use should be pursued with greater energy than has hitherto been displayed in the different coalfields. Many owners have been content to await developments in other districts. At the present time the number of men trained at the stations mentioned above is inadequate to meet effectively the needs of one inspection district alone. Further, it is not reasonable to expect that men trained at these stations should be prepared to be called at any time for service outside their district in order to supply the needs of collieries where no provision has been made for such occasions of emergency, and it places an unfair burden of responsibility on those owners who have taken the precaution to have men trained. We do not think that any colliery-owner should excuse himself on the ground that his mines are not liable to explosion or to fires, and that the use of breathing apparatus is not likely to be required. The dangers of coal-dust are still neither completely ascertained nor properly appreciated, and, having regard to the experience of recent years, no owners should be rash enough to regard themselves as entirely immune against risk of explosion. Underground fires are no doubt more common in some classes of mines—for instance, in Warwickshire and Staffordshire—but there is no mine which can afford to disregard the risk of fire. We have, therefore, come to the conclusion that the provision and use of breathing apparatus should be general throughout the country, and that every mine should either be provided with a properly trained brigade of its own, which appears to us the best arrangement, or have the right to call for a sufficient number of equipped and trained men from a rescue station. In the latter case it is important that some of the men at the mine should be thoroughly trained in the use of the apparatus in order that the rescue party may have the assistance of persons fully acquainted with the particular colliery. The importance of having trained men on the spot has already been

mentioned, and we may refer to Mr. Charles Pilkington's statement that, as a result of the experience gained in connection with the new Lancashire station, they propose to encourage the formation of small stations at the principal collieries (49,375). Different schemes may be necessary to suit the circumstances of different coalfields. The point, however, on which we wish to lay stress is the need for greater activity in the establishment of stations and the training of men, and in the testing of the different types of apparatus with a view to securing their greater perfection. We hope that the progress made in the immediate future in the different districts will render it unnecessary for the Government to make statutory regulations, as it appears to us that for the present the matter can best be dealt with by voluntary organisation. Ultimately, when more extensive experience has been gained, it may be desirable to lay down some general requirements as to the provision of appliances and the training of men."

My inspection of the metalliferous mines shows that the provisions of the "Inspection of Metalliferous Mines Act" are being complied with, though I regret to state that accidents do, and probably always will, happen. Accidents often occur from striking unexploded powder after blasting, and great care should be exercised by employees in this regard. Records of the number of shots responding are generally kept, yet with all the precautions taken, accidents still happen. With the augmentation of the Inspection staff now being completed insuring more frequent inspection, it is to be hoped that a material reduction will be made in the percentage of accidents to the number of persons employed. It may be conceded that the physical structure of the field has in no small degree contributed its quota to our unenviable record in this regard. Conditions are very varied and possess difficulties not met with in more uniform fields. The rapid development of the industry in recent years demands that the statutory safeguards as to the safety of the employees keep pace with the development, and in this regard it is essential that modern life-saving appliances be installed.

INSPECTION OF COAL-MINES, 1909.

VANCOUVER ISLAND AND COAST INSPECTION DISTRICT.

Report of Arch. Dick, Inspector.

Sir,—I have the honour to herewith submit my annual report for the collieries in this district for the year ending 31st December, 1909, together with a list of all accidents and the colliery returns.

The collieries operating during the year, including the new mines that have been started, were :—

Nanaimo : The Western Fuel Company—No. 1 shaft, Protection shaft, and No. 4 Northfield mine.

South Wellington Coal Mines, Limited—Fiddick Colliery, South Wellington, Cranberry District, Nos. 1 and 2 slopes.

Gilfillan Colliery, Wellington No. 1 slope.

New East Wellington Colliery, Mountain District, Nanaimo, No. 1 slope.

Extension : The Wellington Colliery Company—Nos. 1, 2, and 3 mines, all worked from what is known as the No. 1 tunnel, and No. 4 mine, worked by a shaft.

Cumberland : The Wellington Colliery Company—Nos. 4 and 7 slopes, and Nos. 5 and 6 shafts.

Nicola Valley : The Middlesboro Colliery of the Nicola Valley Coal and Coke Company—Nos. 1 and 2 mines.

Diamond Vale Colliery Company—No. 3 mine.

The Western Fuel Company.

Head Office—San Francisco, Cal.

Officers.	*Address.*
John L. Howard, President or Chairman,	San Francisco, Cal.
Jas. B. Smith, Vice-President or Vice-Chairman,	San Francisco, Cal.
D. C. Norcross, Secretary,	San Francisco, Cal.
Joseph L. Schmidt, Treasurer,	San Francisco, Cal.
Thomas R. Stockett, General Manager,	Nanaimo, B. C.
Thomas Graham, Superintendent,	Nanaimo, B. C.

Capital of the Company, $1,500,000.

The above company has operated the following collieries at Nanaimo during the past year, viz. : No. 1 or Esplanade shaft, Nanaimo ; Protection Island mine ; No. 4 Northfield mine.

The following returns show the combined output of the company's mines for the past year :—

RETURNS FROM WESTERN FUEL CO.'S MINES FOR YEAR 1909.

SALES AND OUTPUT FOR YEAR.	COAL.				COKE.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	205,249							
" export to United States	218,936							
" " to other countries	16,987							
Total sales			441,172					
Used in making coke								
" under colliery boilers	58,172							
Total for colliery use			58,172					
			499,344					
Stocks on hand first of year	17,589							
" last of year	10,932							
Difference taken from stock during year.			6,657					
Output of colliery for year			492,687					

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	20		20		40	
Whites—Miners	382				382	
Miners' helpers	29				29	
Labourers	355		17		372	
Mechanics and skilled labour	62		65		127	
Boys	37		25		62	
Japanese						
Chinese			120		120	
Indians, natives of B. C.	3				3	
Totals	888		247		1,135	

No. 1 SHAFT, ESPLANADE, NANAIMO.

John Newton, Manager; John Hunt, Overman.

During the past year I have examined all the accessible parts of this mine.

No. 1 shaft and the Protection island mine may properly be regarded as one mine, since underground they are connected in many places, are ventilated by the same ventilating fan and partly by the same ventilating system, while many of the men working in the No. 1 mine are lowered to their work and hoisted again through the Protection shaft. The underground workings of this No. 1 mine are very extensive, extending, from face to face, for fully five miles. There are two seams of coal being worked in this mine known as the Upper and Lower seams;

the Lower seam is about 60 feet below the Upper, being separated therefrom by a hard conglomerate rock. Two slopes, No. 2 and No. 3, each 7 by 10 feet in size, have now been driven from the Upper seam workings, through this intervening rock, to the Lower seam.

Lower Seam.

The coal in this Lower seam varies from 30 to 40 inches in thickness, is of excellent quality, very hard, and stands handling well. This seam is worked on the "long-wall" system, to which it is well adapted, compressed air-driven coal-mining machines being extensively used with great success, both as regards cost and quantity of production, and a greater percentage of lump coal produced.

The general method of mining this coal is undercutting with a compressed-air cutting machine; the exhaust air serves to assist ventilation. As this is all long-wall work, it sometimes happens that the coal will not remain in place while being undercut by the machine, in which case hand-picking is resorted to. There is a large percentage of this lump coal.

There are two slopes down from No. 1 North level on the Upper seam. These slopes are now connected together, and No. 2 slope is also connected with the Protection shaft. The south side workings are all ventilated by these passages. The coal from these slopes is hauled up to No. 1 North level, on the Upper seam, and thence hauled by electric motors to the foot of No. 1 shaft. The Upper seam workings have now reached No. 3 incline district, where extraction of pillars and a little pillar and stall work is being carried on. This coal comes down No. 3 incline and is hauled away by the motors before mentioned.

No. 1 Slope.

This slope branches off No. 1 North level towards the east, at about 70 yards north of the shaft, and is down 6,513 feet. At 5,055 feet down No. 7 East level branches off the slope, and this forms the deepest workings in the mine, not including the bottom of the slope. No. 7 East level is 1,200 feet vertically below the mud-flats of Nanaimo river. The level was driven 6,000 feet from the slope. It was not extended during the last year, but a large force of men has been engaged in extracting pillars. These workings have been continued to the rise until connection was made with the workings off the Diagonal slope, which is now the main travelling way from No. 7 East level.

At a point about 1,000 yards down No. 1 slope the Diagonal slope branches off to the east. The coal from these workings is raised through No. 1 slope and thence taken to No. 1 shaft, where it is raised to the surface.

The rock tunnel mentioned in a previous report has been completed and much of the coal is brought out this way by the tail-rope system, and delivered at the bottom of the Diagonal slope. Here the coal is taken by another engine and delivered to the endless rope on the main slope. This tunnel opens up a seam some 12 feet thick of good quality.

No. 1 North Level.

The ventilation in this mine is very good, as the level is the return airway from No. 2 slope and Protection. On this level, about a mile from the shaft, the air-current is 72,000 cubic feet per minute. This, with 22,000 cubic feet going out by Newcastle shaft, makes a total of 94,000 cubic feet.

There are 116 men and 20 mules working in this district. The standing works of Protection are also ventilated by this air.

No. 1 Slope.

On No. 7 East level the ventilation is good, the air-current being 20,000 cubic feet for 38 men and 8 mules.

On the Diagonal slope the air-current is 35,000 cubic feet per minute, for 70 men and 8 mules ; a total of 55,000 cubic feet per minute supplied to 120 men and 16 mules.

My inspection was always made with a Wolf safety-lamp, and it was very seldom that I could get any trace of explosive gas. I always examined well up into the breaks in the roof, both in the long-wall and where pillars were being extracted.

Besides the manager and overman, there is employed a large staff of firemen and shot-lighters, who are continually on the move, and would detect and remedy any disarrangement of the ventilation. As a further precaution, a man, called an inspector, is employed, whose duty is to watch and examine the old workings as far as they are accessible. A gas committee, employed and paid by the men, examines the mine once a month, and posts in a conspicuous place the result of such examinations.

Protection Island Mine.

No mining has been done in this property except for the coal necessary for the engines. There is an extensive face opened up in the Lower seam, and a large area of pillars in the Upper seam, where rails are laid.

Method of Ventilation.

As mentioned in a previous report, a new fan has been erected and tested. This fan, a Sirocco, has been at work during the year, giving good satisfaction. It is a double-inlet exhaust fan, 90 inches in diameter, 72 inches in width, running at 275 revolutions a minute, exhausting 200,000 feet of air a minute at the upcast shaft. At the top of the upcast shaft a large Guibal single-inlet exhaust fan is held in reserve. It is 36 feet in diameter and 12 feet wide, running at 45 revolutions a minute.

In addition to these fans, there is a Guibal double-inlet blower fan near the top of Protection shaft. It is 20 feet in diameter, 7 feet wide, and runs at 75 revolutions a minute, and works as helper to the Sirocco fan. Another exhust fan, a Guibal single-inlet, is held in reserve at this point. It is 14 feet in diameter, 6 feet wide, running at 90 revolutions a minute. Ample provision is thus made for ventilation in case of a breakdown.

The following are the official returns from the No. 1 shaft and Protection island mines for the year 1909 :—

Sales and Output for Year.	Coal.				Coke.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	182,253							
" export to U. S.	125,143							
" " to other countries	8,614							
Total sales			316,010					
Used in making coke								
" under colliery boilers, &c.	29,819							
Total for colliery use			29,819					
			345,829					
Stock on hand first of year	13,789							
" last of year	8,327							
Difference taken from stock during year			5,462					
Output of colliery for year			340,367					

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	12		13		25	
Whites—Miners	239	3.30 - 7.00			239	
Miners' helpers	19	2.86			19	
Labourers	218	2.86 - 3.30	11	2.75	229	
Mechanics and skilled labour	40	2.86 - 3.57	42	3.00 - 4.50	82	
Boys	27	1.10 - 2.45	17	.50 - 1.65	44	
Japanese						
Chinese			85	1.50 - 1.75	85	
Indians, natives of B. C.	3	2.86			3	
Totals	558		168		726	

Mine worked 276 days during year.

NORTHFIELD MINE, NANAIMO COLLIERY.

Henry Devlin, Manager.

This mine continues to be an important producer, as is shown by the returns. The workings are for the greater part in the Lower seam, although a few men are working in the Upper seam. In both seams the coal is of good quality, stands handling well, and is in good demand.

The travelling road into this mine is by a slope from the surface, with an easy grade and lighted for a long distance by electricity. The hoisting is done through a shaft 60 feet deep. From the bottom of this shaft a slope extends for about a mile, passing under Exit passage and under Newcastle island to where the coal is being mined. The slope is lighted by electricity from the shaft down, there being a lamp at about every 50 feet and sometimes closer.

The coal is hauled up the slope by an endless-rope system to the shaft bottom, whence it is hoisted to the surface. The hoisting and endless-rope engines are on the surface. The workings off this slope are designated Right or Left levels. To the right are Nos. 1, 2, 3, and 4 levels, of which Nos. 1 and 2 are not sending out coal. To the left are Nos. 1, 2½, 3, 4, and 5 levels. The mining is all on the long-wall system, to which the seam is well adapted. A large number of compressed-air mining machines are in use, giving good results. A good deal of woodwork, besides props, is necessary for cogs to support the roof.

As the coal is 36 inches thick, much material has to be blasted from the roof or floor, usually the latter, to allow the mules to approach the face.

This seam, though thin, is very extensive. It is worked in No. 1 shaft, and is also ready to be worked in Protection shaft, where it has already been worked for years.

By way of this seam a connection has been made with the Newcastle mine, which was worked under the Hudson's Bay Co. This connection is still open and is used as a travelling way from the Northfield mine, if necessary. I have gone out this way several times.

Upper Seam.

The coal in the Upper seam of this mine is known as the Douglas coal. Twenty men are employed here. There are four connections between this seam and the Lower seam, and the

mine is also connected with the Fitzwilliam mine, another old property worked in early times. The coal from the Upper seam goes down a self-acting incline to the slope and is hauled up the slope by the endless rope before mentioned.

Ventilation is good, the air passing in the main return being 82,000 cubic feet per minute. The air is split as follows :—

Split 1,	No. 1	Left level,	10,000 feet for	8 men and 1 mule.	
" 2,	" 2½ & 3	" "	14,000 "	65 "	8 "
" 3,	" 4	" "	9,500 "	24 "	2 "
" 4,	" 1 & 2	Right "	8,300 "	20 "	2 "
" 5,	" 4	Right and 5 Left,	10,200 "	40 "	4 "
" 6,	" 3	Right level,	8,400 "	35 "	
" 7,	old Upper seam,		12,000 "	22 "	1 horse.
" 8,	new "	"	3,500 "	no men working.	
		Totals	75,900 feet	214 men	18 mules.

Thus leaving 6,100 feet leakage unaccounted for.

I have frequently examined all working places of this mine during the year with a Wolf safety-lamp and failed to find a trace of explosive gas.

At this mine there is also an exhaust Murphy fan, of 10 feet diameter, running 200 revolutions a minute.

In addition to the manager, there is a staff of eight shotlighters and firemen constantly on the move to see that everything is all right.

You will observe that the Western Fuel Co. is well supplied with fans, in case of breakdown.

The following are the official returns of the Northfield Colliery for the year ending the 31st December, 1909 :—

Sales and Output for Year.	Coal.				Coke.			
(Tons of 2,240 lbs.)	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.	Tons.	cwt.
Sold for consumption in Canada	22,996	....	.....	....	.....	....	.....	....
" export to U. S	93,793	....	.....	....	.....	....	.....	....
" " to other countries	8,373	....	.....	....	.....	....	.....	....
Total sales	.....	....	125,162	....	.....	....	.....	....
Used in making coke	.....	....	.....	....	.....	....	.....	....
" under colliery boilers, &c.	28,353	....	.....	....	.....	....	.....	....
Total for colliery use	.....	....	28,353	....	.....	....	.....	....
			153,515					
Stocks on hand first of year	3,800	....	.....	...	.....	....	.....	....
" last of year	2,605	....	.....	....	.....	....	.....	....
Difference taken from stock during year	.....	....	1,195	....	.....	....	.....	....
Output of colliery for Year	.....	....	152,320	....	.....	....	.....	....

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	8		7		15	
Whites—Miners	143	3.30 - 5.50			143	
Miners' helpers	10	2.86			10	
Labourers	137	2.86 - 3.30	6	2.75	143	
Mechanics and skilled labour	22	2.86 - 3.57	23	3.00 - 4.00	45	
Boys	10	1.10 - 2.20	8	1.00 - 2.25	18	
Japanese						
Chinese			35	1.50 - 1.75	35	
Totals	330		79		409	

Mine worked 284 days during year.

Wellington Collieries Company, Limited.

Head Office—Victoria, B. C. Capital, $2,000,000.

Officers.

Hon. James Dunsmuir, President, Victoria, B. C.
F. D. Little, Vice-President.
H. M. Hills, Secretary, Victoria, B. C.
J. A. Lindsay, Treasurer.

The Wellington Collieries Company, Limited, has been operating the following mines during the year 1909, under the general management of F. D. Little, M.E. :—

The Extension Colliery, in Cranberry District (Extension); Andrew Bryden, Manager.

The Union Colliery, in Comox District, John Matthews, John Kesley, and W. H. Wall, Managers of the several mines.

The amount and disposition of the output of the company's collieries cannot be given, as this company has refused the required permission, being the only company in the Province so refusing.

EXTENSION COLLIERY.

Andrew Bryden, Manager.

The general supervision of all the mines of this colliery is intrusted to Mr. Andrew Bryden, who has an overman in charge of each separate mine. In addition to the mines in actual operation, subsequently mentioned, the company is now opening up two new mines in the vicinity, one by a slope and the other by a shaft, which are expected before a year has passed to be able to make a good production.

No. 1 or Tunnel Mine.

William Jones, Overman.

All the mining being done at this colliery is pillar coal work and the mining of the fire-clay underlying the coal. Twenty men are employed at this work. Ventilation by a Guibal fan is good, the air being 15,000 cubic feet a minute, going down the shaft for the twenty men and four mules. I have frequently examined all the accessible parts of this mine with a Wolf safety-lamp and failed to get a trace of explosive gas.

No. 2 Mine.

Alexander Shaw, Overman.

This extensive mine is entered by a mile-long rock tunnel. There are two slopes and a motor-road by which coal is hauled to the "cog" at the inner end of the tunnel. The original No. 2 slope, which comes to the surface on the hill above the mouth of the rock tunnel, is open and forms a good travelling way when necessary. A ventilating fan is placed at the entrance to this slope, the slope being the return airway. No. 2 slope goes down past the inner end of the tunnel to the bottom of a basin, from the sides of which the coal is being extracted.

The mining is being done on the pillar-and-stall system, half of the coal being left as pillars and top coal. Thirty-two men are employed at this work. Ventilation is good, air being had from the No. 1 tunnel and an air-shaft away to the rise of the basin referred to. A volume of 12,600 cubic feet of air was passing a minute for thirty-one men and four mules.

No. 2 or the Slant Slope, Extension.

The workings on this slope begin at about 240 yards east of the big tunnel, and are known as the eastern division. The workings are to the dip. Pillar and stall and extraction of pillars are the methods used here. The coal is thin but very good. Timbering is regularly employed, although there is in most places a hard conglomerate roof.

This slope is connected with a new motor-road and its workings, the coal being taken out both ways. Prospects of continued coal-supply are very good in this mine. The roadways and working places are well timbered and a good supply of timbers is kept on hand.

I have frequently examined the accessible parts of this mine with a Wolf lamp, testing all places. On one occasion only did I find a large quantity of explosive gas. This was on the 8th of February, when the ventilating shaft caved in and almost shut off the air. This caused an accumulation of gas, and while going through the old workings by myself I came across a very large body of explosive gas. I reported to the manager, and also to Chief Inspector Shepherd, and gave instructions to the men to keep away, and I posted up notices. This body of gas was so great that it took three days to clear away.

Air supplied for ventilation is as follows: Return airway from the above workings, 27,000 cubic feet; at bottom of motor-road, 12,600 cubic feet; from No. 1 slope on overcast, 24,500 cubic feet; total, 64,100 cubic feet; this being the supply for seventy-eight men and thirteen mules.

In addition to the manager and overman, there is a large staff known as shotlighters and firebosses continually on the move throughout the mine.

No. 3 Mine, Extension.

Alexander Bryden, Overman.

This mine is a continuation of No. 4 West level from the rock tunnel. Most of the mining is from the pillars, there being a large area; of these, a few stalls are also worked. Below the No. 4 West level is No. 3 slope, extending down to a big up-fault, which has put the seam a long way up. The coal is 12 feet thick and of very good quality. The roof is fair. The coal comes down a self-acting incline and is then taken up the slope to the tunnel, where the big motor takes it outside.

Nos. 1, 2, and 3 mines are all connected by travelling ways inside, and connection is had to the outside by two routes, one from the slope and one from the rise workings. The ventilation is from the tunnel. In the main return airway, near the bottom of the slope, the air passing was 18,360 cubic feet a minute for the use of thirty-five men and five mules.

From No. 4 West level to No. 3 level is No. 3 incline. From No. 3 level a series of inclines lead up to No. 1 level. All the mining in Nos. 3, 2½, 2, and 1 levels is extraction of pillars, beginning at the inside and working out. In the upper levels there is very little cover, the conglomerate roof often caving through to the surface. Any gas present goes out these openings, and in some cases air is drawn in by the ventilating fan.

A short distance from these workings is a ventilating shaft about 40 feet deep, containing a ladder-way by which most of the men leave the mine. This shaft is the main air intake for this district, 17,200 cubic feet passing in for thirty-nine men and eight mules. I have frequently examined all these workings and have not found gas.

Besides the manager, there is a staff of firemen patrolling the mine and taking orders for anything the men may require.

About a mile and a half east of the Extension tunnel the Wellington Colliery Company has sunk another shaft, 300 feet to the coal-seam. The seam varies in thickness, sometimes measuring 9 feet and sometimes less. The workings are at present round the bottom of the shaft and are in charge of Thomas Mills, overman, some firemen being also employed.

UNION COLLIERY.

John Matthews, Manager, No. 4 Mine; David Nellist, Overman.

This mine consists of No. 1 and No. 2 slope. No. 1 slope has not been advanced during the year, work being done in Nos. 11, 14, and 15 West levels, and No. 16 East level. In No. 11 West level the work is at pillars, while the pillar-and-stall system is being carried out in the other levels. Ventilation is 55,400 cubic feet of air a minute for seventy men and twelve mules.

No. 2 Slope.

This slope branches off the No. 1 slope to the right, a short distance in from the entrance, and forms the deepest workings in No. 4 mine. The face has been advanced during the year, and the 18th level on each side of the slope is reached. At present Nos. 14, 15, 16, and 17 East levels and Nos. 12, 13, 14, 15, 16, and 17 West levels are being worked. In No. 14 East level and No. 12 West level pillars are being drawn. The coal continues very good, and is 12 feet thick. The lower levels are all in new ground, and promise to be very extensive. The travelling road goes down parallel to the slope, from which it is divided by a thick pillar. The road is intended to be used by all the men and animals. The ventilation of this No. 2 slope is 32,820 cubic feet a minute, split as follows: East side, 16,000 cubic feet for sixty-one men and nine mules; west side, 16,820 cubic feet for sixty-eight men and twelve mules.

I always have a Wolf safety-lamp in working places, old places and caves, occasionally finding small quantities of explosive gas, generally accumulated in a hole in the roof.

A summary of the ventilation of No. 4 mine is as follows: Intake air, No. 1 main slope, 57,120 cubic feet; intake air, travelling road, 37,500 cubic feet; total, 94,620 cubic feet per minute. Split as follows: West side, No. 1 slope, 25,500 feet; No. 15 West and Diagonal slope, 29,900 feet; No. 2 slope, 32,820 feet; total, 88,020 feet; leakage not accounted for, 6,600 feet.

No. 5 Mine.

John Kesley, Manager.

The mining has been done in the Upper seam, some prospecting being done in the Lower seam. The Upper seam coal is very hard and of good quality, but contains a good deal of impurities, which are hard to keep out. Connection is had with No. 6 mine by a good travelling way having double doors, allowing of independent ventilation.

Ventilation is good, 29,250 cubic feet of air passing a minute for forty-nine men and seven mules. The motive power for this air is a Guibal fan, 14 feet in diameter and 5 feet wide.

I have frequently examined the workings of this mine with a Wolf safety-lamp and seldom found a trace of explosive gas.

No. 6 Mine.

John Kesley, Manager; John Gillespie, Overman.

The Upper seam only has been worked during the past year, the coal being the same as that in No. 5 mine. The mine is connected by a travelling road to No. 5 shaft, but the coal is taken out by a separate shaft, ventilation also being independent of No. 5 mine. Air supplied is 30,000 cubic feet a minute to fifty-six men and eight mules. This mine is in good order and free from gas, being frequently examined by me. A great deal of powder is required, owing to the hardness of the coal.

No. 5 and No. 6 each have one shaft lined with 3-inch planks, and 8 feet by 18 feet in the clear, having a compartment at one end which serves as the return airway to the fan, and also as a fan-shaft.

No. 7 Mine.

William H. Wall, Manager.

No. 7 mine is two miles in a direct line from No. 4 mine and four miles from No. 5 mine. The railway passes these other mines, and at No. 7 are very extensive sidings and the machinery for handling a large daily output of coal. The mine is connected with the surface by two slopes and an air-shaft.

No. 1 slope has been extended and is now down 4,400 feet. Faults have caused a good deal of trouble, but in the lower part of the slope the seam is more regular and thicker, averaging about 3 feet 8 inches. This coal is very hard and of good quality, and is known as Cumberland anthracite.

The coal is run some distance up No. 1 slope by an air-hoist, and then switched to No. 2 slope and hauled out to the surface. Arrangements are now being made to haul up No. 1 slope direct to surface.

Ventilation is very good. Air on No. 1 slope, 21,000 feet; on No. 2 slope, 23,520 feet; making 44,520 feet for sixty men and six mules. Explosive gas has only been found on one or two occasions. I have frequently examined this mine with a Wolf safety-lamp.

GILFILLAN MINE,

Now Known as Henry Biggs' Mine.

This mine consists of a small strip of coal that was along the west boundary of the old Wellington Colliery. There is no rock over the coal, and entrance is made by an easy slope about 200 feet long. The rails on this slope have been removed. H. Biggs was working with five men at the pillars all summer, dumping the coal on the bank and selling it to local consumers.

Work ceased when wet weather came on. There is not much coal left, and it is doubtful if work will be continued. The coal is very good and there are several tons on the dump.

Pacific Coast Coal Mines, Limited.

Head Office—Victoria, B. C.

Capital, $3,000,000.

Officers.	*Address.*
John Arbuthnot, President,	Victoria, B. C.
Luther D. Wishart, Vice-President,	New York.
S. H. Reynolds, Managing Director,	Victoria.
Jas. Savage, Secretary-Treasurer,	"
George Wilkinson, Superintendent,	Nanaimo, B. C.

Value of plant, $306,920.

This is a recently organised company and includes in its holdings the Fiddick Colliery of the former South Wellington Mines, Ltd., and certain property at Suquash, on the east coast of Vancouver Island, near Malcolm island, where the company has, within the past year, opened up a new colliery, which is now producing coal. The output of coal made by the company from these two collieries combined is shown in the following table:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	44,802			
" export to U. S.	5,111			
" " other countries	3,074			
Total sales		52,987		
Used in making coke				
Used under colliery boilers, etc	4,280			
Total for colliery use		4,280		
Stocks on hand first of year	2,500			
" last of year	14,288			
Difference added to stock during year		11,788		
Output of colliery for year		69,055		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	9		6		15	
Whites—Miners	153				153	
Miners' helpers						
Labourers	40		8		48	
Mechanics and skilled labour	14		13		27	
Boys	2		4		6	
Japanese						
Chinese			46		46	
Indians						
Totals	218		77		295	

FIDDICK COLLIERY, SOUTH WELLINGTON.

George Wilkinson, Manager. William James, Overman.

This mine is worked from two slopes, No. 1 or Fiddick and No. 2 Richardson slope. No. 1 slope is down 1,500 feet, with two parallels as far as No. 2 East level. In operation off this slope are Nos. 1, 2, 3, and 4 East levels and Nos. 2, 3, and 4 West levels. On No. 1 West level the stalls have reached the outcrop and are being stoped out, pillars being left. No. 1 East level has reached the Richardson boundary, and by permission is now connected with a slope in the Richardson estate, and will be known in future as No. 2 slope. No. 2 East level is in about 600 feet and is confined to exploratory work. No. 3 East level is 400 feet in from the slope, with good stalls with coal varying in thickness from 8 to 20 feet. No. 4 East level is also in good coal. No. 3 West level is in off the slope about 700 feet, with stalls; coal-seam varies from 5 to 24 feet in thickness. No. 4 West level is now being started.

No. 1 slope is now producing 400 tons of coal daily. No. 2 slope is in the Richardson estate and is now down 900 feet, showing very good coal, from 5 to 14 feet in thickness. With a direct haulage from No. 2 slope the daily output is about 250 tons, and the combined output for the two slopes is 650 tons per day.

Ventilation is good; the air in No. 1 slope is 21,000 feet, for 60 men and 3 horses. In the Diagonal slope there are 2,500 feet for 9 men and 1 horse. In No. 2 slope the air is 5,000 feet for 25 men and 2 horses. Total air passing per minute is 29,100 feet for a total of 94 men and 6 horses.

Frequent examination of this mine with a safety-lamp failed to discover gas.

The ventilating machinery consists of a steam-engine and a Sheldon fan, the latter having an exhausting or blowing capacity of 85,000 cubic feet of air a minute with a 1-inch water-gauge.

Besides the hoisting-engine on the slopes, there is an electric-lighting plant, the slopes having a 16-candle-power lamp every 25 feet for a considerable distance down.

Machinery.

On the surface the two slopes empty into the same tipple, which is capable of handling 1,500 tons a day. The coal is dropped by a Phillips-Cross dump into an automatic feeder; thence it goes to a 1-inch screen. All that goes through this screen is collected and loaded into railway cars by draw-doors at the bottom of the bin. From the 1-inch the coal goes to the 5-inch screen, and what goes through is collected in another bin, which is equipped with an automatic sacking arrangement. This consists of a hopper for attaching the sacks to a turn-table, which revolves while the sacks are sewn, and an elevator for raising them into railway cars. In this way three men can sack 120 tons in nine hours. The 5-inch screen is so arranged that by means of a veil it can be closed in a second if it is wished to discontinue sacking, the coal then going right into the railroad cars. While sacking is in progress the coal passing over the 5-inch screen goes straight to the cars, making a select grade of lump coal. The fine coal passing through the 1-inch screen is taken to Boat harbour and washed in a Jeffrey-Robinson cone washer into three grades. The washer has a capacity of 400 tons a day.

The power-house contains two Goldie-McCulloch boilers of 100 horse-power each and 100 lbs. steam-pressure, a dynamo and engine for lighting purposes, one 12x18-inch air-compressor, furnishing power for pumps and underground winches, and a 7x5x7 Fairbanks-Morse pump for boiler-feed and fire purposes. The surface plant is in connection with the machine-shop, which is well supplied with necessary machinery.

There is in connection with the above mine seven miles of standard gauge railway, on which the coal is conveyed to Boat harbour, the shipping point. Two locomotives and thirty Hart-Otis dump-cars of 40 tons capacity are in use. At Boat harbour bunkers of 40,000 tons capacity are erected. The loading is done with a rubber conveyor belt 1,500 feet long, with a capacity of 750 tons an hour.

The bunkers and loading plant are all electric lighted. Power is furnished by two Goldie-McCulloch boilers of 125 horse-power each. The power-house also contains a dynamo and engine for lighting, boiler-feed pump, and a pump for supplying the washer. The washer is a Jeffrey-Robinson cone washer of the most up-to-date type. The company owns other land adjacent to the railway, on which borings have been made with satisfactory results.

As this may be my last report, I could not help drawing attention to the energetic development of this new mine.

The following are the official returns for the Fiddick Colliery for the year 1909:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	44,262			
" export to U. S.	5,111			
" " other countries	3,074			
Total sales		52,447		
Used in making coke				
" under colliery boilers, &c.	3,860			
Total for colliery use		3,860		
		56,307		
Stocks on hand first of year	2,500			
" last of year	13,238			
Difference added to stock during year		10,738		
Output of colliery for year		67,045		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	7		5		12	
Whites—Miners	131	3.30 - 5.00			131	3.30 - 5.00
Miners' helpers						
Labourers	36	2.75	5	2.75	41	2.75
Mechanics and skilled labour	14	2.75 - 3.30	9	2.75 - 3.50	23	2.75 - 3.50
Boys	2	1.25	4	1.25 - 1.50	6	1.25 - 1.50
Japanese						
Chinese			30	1.50	30	1.50
Indians						
Totals	190		53		243	

Name of seams or pits—No. 1 (Fiddick) slope, Upper seam; No 1 (Richardson) slope, Upper seam.

Description of seams, tunnels, levels, shafts, etc., and number of same—Two slopes, sectional area, 12 by 6 feet; one adit level, 12 by 7 feet; one air-shaft, 10 by 12 feet. Seams are what is known as the Upper or Douglas seam, averaging from 6 to 20 feet in thickness and of good quality.

Description and length of tramway, plant, etc.—Seven miles of standard gauge railway to Boat harbour, two locomotives, and thirty Hart-Otis dump-cars, with a capacity of 40 tons each. Bunkers with a capacity of 4,000 tons, with loading conveyor and wharf attached. Power plant at Boat harbour consists of two Goldie-McCulloch boilers, 120 horse-power each, one dynamo and engine for lighting purposes, boiler-feed pump and pump for washery. Washery consists of one Jeffrey-Robinson washer with a capacity of 400 tons per hour.

At mine: Power-house contains two Goldie-McCulloch boilers, 100 horse-power each (all the boilers are of the return tubular type); one Ingersoll air-compressor; one dynamo and engine for lighting purposes; one thoroughly equipped tipple, capacity 1,500 tons per nine hours; one thoroughly equipped machine-shop; one friction-hoist, double drum, for haulage purposes (12 by 15); one Sheldon fan, diameter 9 feet, engine (9 by 12).

Winches for haulage underground, three—one 7 by 8, one 5 by 8, one 5 by 7.

Pumps—Two Cameron No. 5, capacity 50 gallons a minute.

" Duplex, $4\frac{1}{2}$ by $2\frac{3}{4}$ by 4, 25 " "
One " $5\frac{1}{4}$ " $3\frac{1}{2}$ " 5.
" " 7 " 5 " 7.
" " 3 " 2 " 3.

Two horse-power, 4 by 6.

One hundred and forty mine cars, capacity 2,800 lbs., and approximately three miles of narrow-gauge track for haulage.

SUQUASH COLLIERY.

This colliery is owned by the Pacific Coast Coal Mines, Ltd., and is situated on the north end of Vancouver Island. In a previous report a shaft was said to be down 120 feet, and that coal was expected at 160 feet. The seam was struck at 170 feet, and was found to be 6 feet in thickness. From 4 feet 8 inches to 5 feet 6 inches is good, almost smokeless, coal, the partings consisting of small bands of rock. This seam (called the Lower seam) dips north-east towards Malcolm island, with a pitch of 1 in 8.

The shaft now down is 6 by 10 feet in the clear, and is intended for the air-shaft. A new hoisting-shaft will be sunk this summer. An up-to-date hoisting plant, to handle 1,500 tons a day of nine hours, will be put in. Development work is being pushed from the present shaft, and about 6,000 feet of tunnelling has been done. The method of work will be a combination of long-wall and pillar-and-stall. All the available area under the land will be long-wall, while pillar-and-stall will be used under the sea. A large shaft pillar of 400 by 200 feet has been left. The main shaft levels are driven 12 feet wide and with a 66-foot pillar between the parallel. The long-wall places are turned away from the parallel level, so that the main road will be solid and have ample protection. The main shaft No. 1 levels are now in 450 feet on each side of the shaft, and are on directions of N. 45° W. and S. 45° E., respectively. On the south-east side of the shaft a pair of slopes are turned away to the full dip of the seam, N. 45° E., and are down 450 feet. At 400 feet down another pair of levels, known as No. 2 levels, are turned away S. 45° E. They are in about 150 feet at present and are being pushed as rapidly as possible. Pillar-and-stall work will be used, with pillars 40 feet and stalls 20 feet wide. In the long-wall work pillars are turned with 36-foot centres.

Extensive clearing has been done on the surface, and twenty houses, including a store carrying a full stock and a post-office, have been built.

A preliminary railway survey has been run from McNeil bay to Suquash, and in all probability a railway, wharves, and bunkers will be built this year.

Not having been to Suquash, I am indebted to Mr. George Wilkinson, Superintendent at Suquash, for the above report.

The following are the official returns for the year 1909 :—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	540			
" export to U. S.				
" " other countries				
Total sales		540		
Used in making coke				
" under colliery boilers, &c.	420			
Total for colliery use		420		
		960		
Stocks on hand first of year				
" last of year	1,050			
Difference added to stock during year		1,050		
Output of colliery for year		2,010		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	2	.....	1	.....	3	.....
Whites—Miners	22	4.00	.....	.....	22	4.00
Miners' helpers	.....	.....	.....	.....	.....	.....
Labourers	4	3.00	3	2.75 - 3.00	7	2.75 - 3.00
Mechanics and skilled labour	.....	.....	4	3.50	4	3.50
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	16	1.50	16	1.50
Indians	.....	.....	.....	.....	.....	.....
Hindus	.....	.....	.....	.....	.....	.....
Totals	28	.....	24	.....	52	.....

Name of seams or pits—Suquash.

Descriptions of seams, tunnels, levels, shafts, etc., and number of same—One shaft 6 by 10 feet, with midwall, one side for hoisting and the other for ventilation. Seam about 6 feet in thickness and of good quality.

Description and length of tramway, plant, etc.—One donkey-engine and boiler, one pump, and one small fan for ventilation.

The Vancouver-Nanaimo Coal Mining Co., Ltd.

Head Office—Vancouver, B. C.

Capital, $250,000.

Officers.	*Address.*
H. W. Maynard, President,	Vancouver, B. C.
Alvo V. Alvensleben, Vice-President,	"
W. R. Phillips, Secretary-Treasurer,	"
J. J. Grant, Managing Director,	Nanaimo, B. C.

Value of Plant, $17,849.41.

NEW EAST WELLINGTON COLLIERY.

George Bradshaw, Manager.

This mine (mentioned in a previous report as a prospect) is opened by a slope angling across the pitch of the place where the coal should be to the east. The slope is down 750 feet, on a pitch of 29°, and shows a little coal all the way. It is situated on the north side of the Little mountain having the Western Fuel Co.'s land to the south-east, and that of the Wellington Colliery on the north-west. Coal was reached at 1,040 feet, the seam being 6 feet thick and almost flat, and formed of very hard coal. Four hundred feet of drifting has been done, and the seam is found to vary in thickness, and to be very good hard coal. It is a continuation of the well-known old Wellington coal. On striking the coal and obtaining an idea of its continuance, the company made a second connection with the surface.

Ventilation is fairly good, the air passing being 28,000 feet for fifteen men. The superintendent, Mr. Grant, states that a ventilating fan has been ordered.

I have examined all the above-mentioned workings with a Wolf safety-lamp, and have found no trace of explosive gas.

Railway connection is now had with the Esquimalt & Nanaimo Railway, the cars being brought under the chute.

The following are the official returns for the year 1909 :—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	8,636			
" export to U. S.				
" " other countries				
Total sales		8,636		
Used in making coke				
" under colliery boilers, &c	500			
Total for colliery use		500		
		9,136		
Stock on hand first of year				
" last of year	200			
Difference added to stock during year		200		
Output of colliery for year		9,336		

Number of Hands Employed, Daily Wages Paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	1	5.00	1	2.88½	2	3.45
Whites—Miners	25	4.68¾			25	4.68¾
Miners' helpers						
Labourers	7	2.75	4	2.75	11	2.75
Mechanics and skilled labour	1	3.00	6	3.00	7	3.00
Boys						
Japanese						
Chinese			6	1.75	6	1.75
Indians						
Totals	34		17		51	

Name of seam or pits—Wellington seam.

Description of seams, tunnels, levels, shafts, etc., and number of same—Bituminous seam, average height, 5 feet; two slopes, main and counter; average pitch, 27°; length, 900 feet; direct haulage on slope.

Description and length of tramway, plant, etc.—Two levels driven in seam 900 feet.

Nicola Valley Coal & Coke Co., Ltd.

Head Office—Vancouver, B. C.

Capital, $1,107,700.

Officers.	*Address.*
John Hendry, President,	Vancouver, B. C.
Alexander McLaren, Vice-President,	"
W. H. Armstrong, Managing Director and General Manager,	"
J. J. Plommer, Secretary-Treasurer,	"
James Gray, Mine Superintendent,	Middlesboro, B. C.

Value of plant, $170,000.

MIDDLESBORO COLLIERY.

James Gray, Manager.

This colliery has been idle for a good part of the year, as will be seen in the annual returns.

No. 1 Mine.

Hugh Gillespie, Overman.

The mine is operated through an adit tunnel, all the workings being to the rise. A slope was driven from a point in what is known as Coal gully, on the side-hill, to the west and above the portal. At the entry of the slope in the gully there are installed an engine, hoist, and small ventilating fan, the slope being used as a return airway.

The stalls are worked from a level road across the pitch. The hoist draws the full cars out to the slope and lowers them to the adit tunnel, through which they are hauled by horse to the surface. Empty cars are also brought in by this route.

The ventilation is good, there being 7,560 feet of air passing in the main tunnel for thirty-eight men and one horse. I have examined the above-mentioned mine with a safety-lamp and failed to find a trace of explosive gas. The workings are well timbered.

No. 2 Mine.

David Gray, Overman.

This mine, half a mile to the south of No. 1, is also worked through an adit level. This level was not advanced much last year, and only a few places are being worked to the rise. On one side of the level the outcrop was reached and on the other a fault encountered. At the entrance to the adit level a slope was begun which is now down about 600 feet, and some fine workings in 5 feet of coal are now in progress. All the coal was mined on the long-wall system, but is now worked by pillar and stall. Considering the nature of the roof, a hard sandstone, and the lack of waste material for gobs, this seems to be the safest and cheapest way to work here. The coal is hoisted out through the slope by a steam-engine.

The ventilation is good, 19,250 feet of air being supplied to sixty-two men and one horse. The motive power for this air is a small fan 48 inches in diameter, placed in the return air-way between the adit tunnel and the slope. The air is now on the intake for the rise workings, the air-shaft being high up. The fan is worked by a steam-engine. The boiler is some distance outside the mine, and pipes convey the steam through the adit tunnel to the fan. The pipes serve also to warm the tunnel in winter. There are double doors in the tunnel, and such air as gets through these doors helps the places on the rise.

At No. 3 mine nothing is being done.

No. 4 Mine.

This is a prospect place where considerable work has been done. Five men are now working here. Ventilation is good, 4,000 feet of air passing a minute.

No. 5 Mine.

This is the highest opening made by this company. Entrance is made by an adit tunnel. Much trouble is caused by faults, while sometimes the coal is very good. The coal is sent down a long chute to the entrance of No. 1 mine and is hauled on the same tipple.

Ventilation is good, 10,800 feet of air being supplied to fifteen men and one horse. I have frequently examined this mine and found no trace of explosive gas. The workings are well timbered.

A good deal of machinery has been added during the year. Two large boilers, a steam-engine, and a large compressor have been put in. Compressed-air coal-cutting machines have been used in No. 1 mine.

The following are the official returns for this colliery for 1909 :—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	61,546			
" export to United States				
" " to other countries				
Total sales		61,546		
Used in making coke				
" under colliery boilers, etc.	545			
Total for colliery use		545		
		62,091		
Stocks on hand first of year	321			
" last of year	440			
Difference added to stock during year		119		
Output of colliery for year		62,210		

Number of Hands Employed, Daily Wages Paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance			3	15.00	3	15.00
Whites—Miners	87	4.50			87	4.50
Miners' helpers	23	2.75			23	2.75
Labourers			18	2.50 - 2.75	18	2.50 - 2.75
Mechanics and skilled labour			13	3.30 - 5.00	13	3.30 - 5.00
Boys			1	1.50	1	1.50
Japanese						
Chinese						
Hindus						
Totals	110		35		145	

Name of seams—No. 1 mine, Jewell seam; No. 2 mine, Ells seam; No. 4 mine, Major seam; No. 5 mine, Ells seam.

Description of seams, tunnels, levels, shafts, etc., and number of same:—

No. 1 mine—Main tunnel 9 feet by 7½ feet into Jewell seam, 18½ feet thick, is in a distance of 1,460 feet, forming main haulage and intake airway. Slope, 6 feet by 6 feet, is 830 feet long, forming main return airway. Ordinary rooms, including crosscuts and counter-levels, are about 3,500 feet into the ordinary working places.

No. 2 mine—Main tunnel 12 feet by 6 feet into Ells seam, 6 feet thick, is in a distance of 1,560 feet, forming main haulage and intake airway. Slope, 6 feet by 5 feet, is 150 feet into working places. Shaft, 7 feet 8 inches by 7 feet 8 inches by 46 feet, with stair therein; slope and shaft forming the two main return airways and escapes. A new slope has been started at this mine, going to low side of main tunnel, and is 9 feet by 6 feet, and is down 815 feet, and is connected to main tunnel. Ordinary chute-ways, including crosscuts and counter-level, about 4,700 feet into working places.

No. 4 mine—Main tunnel is 9 feet by 7½ feet into Major seam, 14½ feet thick, is in 450 feet; counter-level 300 feet. A new tunnel, same as main tunnel, is in 250 feet, which forms main intake and haulage road. Ordinary rooms, including crosscuts and counter-level, are about 1,200 feet into ordinary working places, and thence to air-shaft, 7 feet 8 inches by 7 feet 8 inches by 52 feet.

No. 5 mine—Main tunnel 9 feet by 7½ feet in Ells seam, 5 feet thick, is in 1,020 feet, forming main haulage and main intake airway. Slope, 6 feet by 5 feet, is down 130 feet, forming main return airway, with counter therefrom in 800 feet.

Modes of working—Nos. 1, 2, and 4 are worked pillar-and-stall. No. 5 will be worked long-wall.

Main tunnels—All provided with drainage ditches. Also single track graded to 1 in 200.

Description and length of tramway, plant, etc.:—

Haulage—Above and under ground by horse-power. Surface tramways to tipples being 430, 530, 390, and 396 feet, respectively, at mines Nos. 1, 2, 4, and 5, with trestles 210, 140, and 65 feet at mines Nos. 1, 2 and 4.

Tunnels and tramways—All laid to a 36-inch gauge with flat-bottomed steel rails, fish-plated, weighing 30 lbs. a yard. A Phillips tipple at each of Nos. 1, 2, and 4 mines. A Jeffrey coal-cleaning plant; also an electric plant at No. 1 mine. Good water supply from a Worthington steam pump at No. 2 mine; capacity, 150 gallons a minute. Also three Beatty hoisting engines. A new air-compressor supplied by the Canadian Rand Co., Ltd., of Sherbrooke, Quebec; capacity, 2,215 cubic feet of air a minute. Also two new return tubular steam boilers by Goldie, McCulloch Co., of Galt, Ont.; steam pressure, 160 lbs. a square inch.

Diamond Vale Collieries, Limited.

Head Office—Vancouver, B. C.

Capital, $750,000.

Officers.	*Address.*
T. J. Smith, President,	Vancouver, B. C.
J. H. Sanderson, Vice-President,	"
F. J. Lumsden, Secretary-Treasurer,	"
Benj. Browitt, Superintendent,	Merritt, B. C.

DIAMOND VALE COLLIERY.

Benjamin Browitt, Manager.

This company's property lies immediately to the south of the Middlesboro Colliery, the Coldwater river being the boundary between them. The two shafts mentioned in the previous report are not being continued, and the machinery has been removed.

No. 3 Mine.

This mine is about two miles east of the above shafts. The slope, 450 feet down, has not been extended during the year. At the bottom of this slope a short level was driven. On the south side, No. 3 South level was driven 240 feet. Four men were employed in No. 3 North level, and one man in the bottom level. Altogether, nine men produced 19 tons of coal—that is the mine run. No work has been done since March. Ventilation by a small fan was good.

The company has done much prospecting, by hand and diamond-drill, but I am unable to say what the result of the drilling was. Exploration is being continued.

Vermilion Forks Mining and Development Co., Ltd.

Head Office—15 Great St. Helens, London, E. C.

Officers.	*Address.*
Sheffield Neave, Chairman,	London, Eng.
Alex. Crerar, Director,	"
Arthur Hickling, Director,	"
Oswald J. Bambridge, Director,	"
Ernest Waterman, Local Director,	Princeton, B. C.
Charles Graham, Superintendent,	"

This company only began operations in December.

The following are the official returns for the year ending 1909 :—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	80			
" export to U. S	40			
" " other countries				
Total sales		120		
Used in making coke				
" under colliery boilers, &c	20			
Total for colliery use		20		
		140		
Stocks on hand first of year				
" last of year	10			
Difference added to stock during year		10		
Output of colliery for year		150		

EAST KOOTENAY INSPECTION DISTRICT.

REPORT OF THOMAS MORGAN, INSPECTOR.

I have the honour, as Inspector of Coal-mines for the East Kootenay District, to submit my annual report for the year 1909.

Until within this last year there has been only one company actually producing coal in the East Kootenay District, that is, the Crow's Nest Pass Coal Co., although this company operated three separate collieries; but during the year two new companies have begun to produce, namely, the Hosmer Mines, Limited, at Hosmer, and the Corbin Coal and Coke Co., at Corbin. These new companies only began to ship coal towards the latter part of 1908, and, consequently, their outputs this year have not been large, but they have extensive and fully equipped collieries, and in the future will be important factors in the production of the district.

Crow's Nest Pass Coal Co., Ltd.

Officers.	*Address.*
Elias Rogers, President,	Toronto, Ont.
E. C. Whitney, Vice-President,	Ottawa, "
R. M. Young, Secretary,	Fernie, B. C.
Elias Rogers, Treasurer,	Toronto, Ont.
Jas. Ashworth, General Manager, Operating Department.	Fernie, B. C.

Capital of the Company, $3,500,000.

The above company is now operating the following extensive collieries on the western slope of the Rocky mountains in the East Kootenay District, viz. :—

COAL CREEK COLLIERIES, situated on Coal creek, about five miles from the town of Fernie, on a branch railway to the mines.

MICHEL COLLIERIES, situated on both sides of Michel creek, on the line of the Canadian Pacific Railway, being twenty-three miles in a north-easterly direction from Fernie.

CARBONADO COLLIERIES, situated on Morrissey creek and connected by a branch railway with the Canadian Pacific Railway and the Great Northern Railway at Morrissey. The colliery is about fourteen miles from Fernie by rail, in a south-easterly direction. This colliery has been shut down for more than a year, but is now being opened up again.

The total output of the company's collieries for the past year was 802,717 tons. Of this 330,189 tons were used in the manufacture of coke, yielding 223,442 tons, which, with 677 tons of coke taken from stock, makes the amount of the coke sales 223,977 tons, of which 183,499 tons were sold for consumption in Canada, and 40,478 tons were exported to the United States. The coal exported to the United States amounted to 297,794 tons, while 120,166 tons were sold for consumption in Canada.

The amount and disposition of this combined output of the company's collieries is more fully shown in the following table:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	120,166		183,499	
" export to United States	297,794		40,478	
" " other countries				
Total sales		417,960		223,977
Used in making coke	330,189			
Used under colliery boilers, &c.	55,358		142	142
Total for colliery use		385,547		
		803,507		224,119
Stocks on hand first of year	853		857	
" last of year	63		180	
Difference taken from stock during year		790		677
Output of collieries for year		802,717		223,442

NUMBER OF HANDS EMPLOYED.

CHARACTER OF LABOUR.	NUMBER EMPLOYED.		TOTAL NUMBER EMPLOYED.
	Underground.	Above Ground.	
Supervision and clerical assistance	50	22	72
Whites—Miners	661		661
Miners' helpers			
Labourers	185	273	458
Mechanics and skilled labourers	143	206	649
Boys	23	5	28
Japanese			
Chinese			
Indians			
Total	1,362	506	1,868

COAL CREEK COLLIERY.

Elijah Heathcote, Manager.

This colliery is situated on Coal creek, about five miles east of Fernie. The following mines have been in operation during the year:—

Nos. 1, 5, and 9, on the north side of Coal creek, and Nos. 2 and 6, on the south side of the creek; Nos. 11 and 12 mines, about midway between Fernie and Coal creek, on north side of the creek; the last two mentioned mines have, however, been closed down since the early part of the summer and all the rails taken out.

NEW NO. 1 MINE, NORTH.

W. Wilson, Overman; R. Adamson, A. Horrocks, and C. McNay, Firemen.

On December 2nd, 1909, I examined all the workings of this mine and found them in good order throughout, well timbered and with ample ventilation, there being 35,400 cubic feet of air a minute circulating, for the use of fifty-eight men and six horses. The ventilation is produced by the fan at No. 9 mine, an airway having been driven through the strata from one seam to the other.

Blasting is allowed in this mine where the coal is hard, but only "permitted" explosives are used, and all shots are fired by battery. Wolf safety-lamps only are used underground.

The general and special rules and a plan of the mine are kept posted up outside in plain sight.

NO. 9 MINE.

B. Caufield, Overman; J. Caufield, J. McPherson, and T. K. Knox, Firemen.

On December 2nd, 1909, I last went all through this mine and examined it. I found the mine in good order, clear from explosive gas, and well timbered.

The ventilating air-current was 22,750 cubic feet of air a minute, quite sufficient for the use of sixteen men and three horses. Blasting is not permitted in this mine and safety-lamps are used exclusively. The work being done in this mine at present is confined to the extraction of pillars.

The general and special rules and a plan of the mine are posted up near the entrance, while a barometer is in plain sight at the lamp-house.

NO. 2 MINE.

W. Lancaster, Overman; J. Baggaley, J. Bushnell, J. Biggs, H. Landfear, and W. Joyce, Firemen.

On December 3rd, 1909, I examined all this mine, including all parts of Districts Nos. 1 and 4, and the old No. 3 mine.

No. 1 District.—I examined this district throughout and found gas in two stalls, over the timbers; the stalls were high and one was not working until a crosscut would be holed through, which would bring the air up to the face and keep the place clear of gas. On the left side of the incline the ventilating current amounted to 10,500 cubic feet of air, for the use of twelve men and one horse. On the right side of the incline the air-current was 21,000 cubic feet, for the use of thirty-two men and four horses.

No blasting is done in the district, and safety-lamps only are used.

No. 4 District.—I found this district all in good order and well timbered, with 27,000 cubic feet of air circulating for thirty-eight men and three horses. All the workings in this district are narrow workings; no blasting is allowed, and safety-lamps only are used.

No. 3 Mine District.—On December 3rd, 1909, I last examined this district, and found it all in good order, well timbered and clear of gas, with a ventilating current of 16,640 cubic feet of air circulating for eighteen men and one horse. There is some blasting allowed in parts of this district where the coal is hard, but not all over. The total air circulating through the working places of the mine was 75,140 cubic feet a minute, while the air-current at the fan-shaft was 180,000 cubic feet, leaving 104,860 cubic feet of air escaping by doors and stoppings to circulate through the old workings of the mine to keep them clear.

No. 5 Mine.

D. Martin, Overman; J. Stewart, H. Miard, W. McFegan, W. Cummings, and T. Nanson, Firemen.

On December 27th, 1909, I made an inspection of this mine, and found the workings in good order and well timbered throughout; the ventilation was sufficient all over the mine, and the airways in good condition. In No. 19 incline there was in circulation 28,000 cubic feet of air, for the use of fifty men and six horses. In No. 47 incline district the air-current was 47,500 cubic feet, for fifty-five men and five horses. In the Slope district the air-current was 28,000 cubic feet, for fifty-six men and six horses.

The mine is being worked on the pillar-and-stall system with extraction of pillars. Safety-lamps only are used, and no blasting is allowed.

No. 1 Mine, South.

T. France and L. C. Stearns, Firemen.

This mine was only in about 600 feet on December 28th, 1909, on which date I examined it and found everything in good order, and the mine well timbered. The ventilation was good, there being 20,000 cubic feet of air in circulation for the use of twenty-two men and two horses. The mine is being worked on pillar-and-stall system, safety-lamps only are in use, and no blasting is allowed.

No. 5 South.

Joseph Worthington, Overman.

This mine is only in about 200 feet, a tunnel and counter, but 10,000 cubic feet of air is supplied for the use of four men.

Old No. 1 North.

Old No. 1 mine, on the north side of the creek, is being reopened, the old tunnel is being cleared out and a counter driven. The ventilation at present is 11,000 cubic feet for six men and one horse.

The following are the official returns for the Coal Creek collieries for the year 1909 :—

SALES AND OUTPUT FOR YEAR. (Tons of 2,240 lbs.)	COAL.		COKE.	
	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	44,419		102,267	
" export to United States	134,259		14,888	
" " other countries				
Total sales		178,678		117,155
Used in making coke	172,944			
" under colliery boilers, etc.	28,511			
Total for colliery use		201,455		
		380,133		
Stock on hand first of year	201		67	
" last of year	36		180	
Difference { * added to / † taken from } stock during year		†165		*113
Output of colliery for year		379,968		117,268

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC., INCLUDING FERNIE COKE-OVENS.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and clerical assistance	27		9		36	
Whites—Miners	315				315	
Miners' helpers						
Labourers	82		143		225	
* Mechanics and skilled labour	216		107		323	
Boys	18		3		21	
Japanese						
Chinese						
Indians						
Totals	658		262		920	

* NOTE.—Mechanics and skilled labour include: Underground—Drivers, motormen, rope-riders, hoistmen, trackmen, bratticemen, timbermen, pumpmen, fanmen, and carpenters. Above ground—Lampmen, weighmaster, tipplemen, firemen, machinists, carpenters, blacksmiths, engineers, and electric plant firemen.

Name of seams or pits—The following mines are working: Old No. 1, No. 1 North, No. 1 South, No. 2, No. 5 North, No. 5 South, No. 9, No. 0 South.

Description of seams, tunnels, levels, shafts, etc., and number of same—

No. 1 North, No. 2, No. 5 North, and No. 9 are the same as last year.

Old No. 1 mine was abandoned in 1906, but is being reopened; the coal is 9 feet thick.

No. 1 South: The seam is 8 feet thick, and is being opened by an entry tunnel from the surface.

No. 5 South: The seam is 5 feet thick, and is being opened by an entry tunnel from the surface.

No. 0 South: The seam is 4 feet thick, and is being opened by an entry tunnel from the surface.

Description and length of tramway, plant, etc.—The same as last year. New permanent slack-bins are being erected at Fernie coke-ovens, but are not completed.

MICHEL COLLIERY.

Norman Fraser, Manager.

This colliery is situated at Michel, about twenty-four miles in a north-easterly direction from Fernie. The following mines have been in operation during the year: Nos. 3, 4, and 5 on the south-west side, and No. 8 on the north-east side of Michel creek.

No. 5 Mine.

Thomas Spruston, Overman; Joseph Mason, Wm. Simister, and Ed. Heyes, Firemen.

On December 6th I last examined this mine, and found a little gas on the upper side of No. 2 East level, and a little on the upper side of the counter-level; I also found gas on the upper side of No. 3 stall, on the upper side of No. 1 incline in No. 4 West level, but the places were not working until a crosscut should be made through from the next working place. On the east side of the slope I found 40,000 cubic feet of air circulating for the use of twenty-five men and three horses, and on the west side of the slope 12,200 cubic feet of air for twenty-two men and two horses. The total air at the fan-shaft was 70,000 cubic feet, while the total air circulating in the workings was 52,200, leaving 17,800 cubic feet to be accounted for by leakage to ventilate the old workings. The airways and travelling roads were all in good order, no powder is used in the mine, and safety-lamps only are used.

Copies of the general and special rules and a plan of the mine are kept posted up at the mouth of the mine, as required by the Act.

No. 3 Mine.

Thos. Spruston, Overman; Thos. Cunliffe, Adam Watson, and Thos. Mathers, Firemen.

On December 6th, 1909, I examined the workings of the Slope district, and found all in good order, well timbered, and cogged. The ventilation of the district is good. The district is being worked in 40-foot stalls and 200-foot pillars for 500 feet, and then retreating with the pillars; the slopes are driven 1,000 feet apart. I found 17,600 cubic feet of air circulating for the use of twenty-four men and three horses.

No. 4 Mine.

Same Officials as No. 3 Mine.

I examined this mine on December 7th, and found a little gas on the upper side of No. 4 room, off No. 1 incline, above the timbers, but the stall was not working, and I found a little gas in the crosscut, off the counter-level, No. 2 East level. The balance of the mine was clear and well timbered, with good ventilation and the air-course in good order. I found 59,000 cubic feet of air travelling for the use of forty men and four horses.

The levels of the mine are all narrow work, and the stalls of the ordinary width. No blasting is done in the mine and safety-lamps only are used.

No. 8 MINE.

John Shanks, Overman; Andrew Matuskey, Henry Massey, Wm. Davis, Wm. Eccleston, W. J. Mazey, and T. Tonge, Firemen.

On December 8th I examined the No. 17 chute district and the No. 3 incline district of this mine, and found all the workings in good order and well timbered, and the ventilation throughout good, there being in the chute district 13,000 cubic feet of air circulating for the use of fifty men and seven horses, while in the No. 3 incline district there were 22,000 cubic feet of air for fifty-five men and eight horses. The mine is worked on the pillar-and-stall system, and no blasting is allowed in the mine; safety-lamps only are used.

Slope District.—On December 9th I examined the Slope district. I found the mine free from standing gas, but there was an undue percentage of gas in all the air of this district, as the mine was making a good deal of gas; however, I expect by this time the air will be clear, as the air-course from outside was being reconstructed, and was nearly finished at the time of my inspection. This section is also worked on the pillar-and-stall system, and no blasting is permitted. The ventilating current in the district measured 24,000 cubic feet of air a minute for forty-six men and seven horses.

Copies af the general and special rules, a plan of the mine, and a barometer and thermometer were hung up near the entrance of the mine, where they could be seen by all the workmen.

No. 7 MINE.

Wm. Robinson, Overman; Jas. Berry, Wm. Harmison, and W. Almond, Firemen.

On December 9th I examined this mine and found a little gas at the face of the East incline, but all the remainder of the workings were clear and in good order and well timbered. The ventilation was good, there being an air-current in circulation of 30,000 cubic feet of air a minute for the use of sixty-three men and two horses. The mine is worked on the pillar-and-stall system, the inclines being driven up the pitch and the stalls across the pitch. There is some blasting done in the west side of the mine, where the coal is hard to mine.

The following are the official returns of Michel Colliery for the year 1909:—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	75,234		81,232	
" export to United States	132,581		25,590	
" " other countries				
Total sales		207,815		106,822
Used in making coke	157,245		142	
" under colliery boilers, etc	25,546			
Total for colliery use		182,791		142
		390,606		106,964
Stock on hand first of year	171		790	
" last of year	27			
Difference taken from stock during year		144		790
Output of colliery for year		390,462		106,174

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC., INCLUDING COKE-OVENS.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and clerical assistance	19		12		31	
Whites—Miners	315				315	
Miners' helpers						
Labourers	98		121		219	
* Mechanics and skilled labour	220		88		308	
Boys	5		2		7	
Japanese						
Chinese						
Indians						
Totals	657		223		880	

Name of seams or pits—Nos. 3, 4, 7, and 8 mines working.
Description of seams, tunnels, levels, shafts, etc., and number of same—Same as last year.
Description and length of tramway, plant, etc.—Same as last year.

CARBONADO COLLIERY.

Edward Bridge, Manager.

The Carbonado Colliery of the Crow's Nest Pass Coal Co., on Morrissey creek, was worked during the early part of the year, when some new seams of coal and new portions of old seams were opened up; but as much trouble was met with from outbursts of gas, similar to those met with in the earlier opening of the colliery, and as the coal mined produced such a great proportion of fines, the mines were shut down in August, 1909, and have since that date remained idle.

The following are the official returns of output made during the portion of the year 1909 in which the mines worked :—

SALES AND OUTPUT FOR YEAR.	COAL.		COKE.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	513			
" export to United States	30,954			
" " to other countries				
Total sales		31,467		
Used in making coke				
Used under colliery boilers, etc.	1,301			
Total for colliery use		1,301		
		32,768		
Stocks on hand first of year	481			
" last of year				
Difference taken from stock during year		481		
Output of colliery for year		32,287		

NUMBER OF HANDS EMPLOYED, DAILY WAGES PAID, ETC.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTALS.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
Supervision and clerical assistance	4		1		5	
Whites—Miners	31				31	
Miners' helpers						
Labourers	5		9		14	
Mechanics & skilled labour.	7		11		18	
Boys						
Japanese						
Chinese						
Indians						
Totals	47		21		68	

Name of seams or pits—Nos. 7 and 8 mines. No. 7 worked until August 31st, 1909, when this colliery was closed down. No. 8 mine was closed down February 22nd, 1909, and the equipment withdrawn.

Description of seams, tunnels, levels, shafts, etc., and number of same—Same as last year.

Description and length of tramway, plant, etc.—Same as last year.

Hosmer Mines, Limited.

Head Office—Montreal.

Officers.	*Address.*
W. D. Matthews, President,	Toronto, Ont.
B. T. Coon, Treasurer,	Bankhead, Alta.
Lewis Stockett, General Manager,	Hosmer, B. C.
David G. Wilson, General Superintendent,	"

Capital of Company, $1,500,000.

Value of plant, $1,000,000.

HOSMER COLLIERY.

David G. Wilson, Manager; John Musgrave, Overman.

(A description of this plant will be found on page 170 of this report.)

This colliery has been opened up by two parallel tunnels driven in, crosscutting the measures and the various coal-seams. These tunnels are now in 3,700 feet, and the work of opening out has been begun on Nos. 2, 3, 5, 6, 8, 9, and 10 seams.

On December 22nd last, I inspected this mine and found the workings throughout in good order and well timbered, and the ventilation good. Work so far has been chiefly confined to development, driving levels off from the main tunnel and a few inclines from the levels.

The total air circulating at the fan-shaft, 104,000 cubic feet; revolutions of fan, 97; water-gauge, 2 inches.

The following shows the amount of ventilating current and the number of men employed in each mine at one time :—

Mine.	Air-current.	Men Employed.
No. 3	1,700	0
" 5	3,300	24
" 6 S	18,130	29
" 6 N	5,500	0
" 8 S	3,500	0
" 8 N	980	0
" 9 S	2,000	17
" 9 N	2,000	0
" 10	19,200	13

This company only began shipping on December 1st, 1908, and the following are the official returns for the year 1909 :—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	11,600	.....	21,892	.....
" export to United States	43	.....	.....	.....
" " other countries	.....	.....	.....	.....
Total sales	.....	11,643	.....	21,892
Used in making coke	35,275	.....	.....	.....
" under colliery boilers, etc.	12,180	.....	.....	.....
Total for colliery use	.....	47,455	.....	.....
Stocks on hand first of year	249	.....	406	.....
" last of year	1,475	.....	89	.....
Difference { * added to / † taken from } stock during year	.....	*1,226	.....	†317
Output of colliery for year	.....	60,324	.....	21,575

Number of Hands Employed, Daily Wages Paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		
Supervision and clerical assistance	6	3.75 - 6.00	10	3.00-10.00	16	.....
Whites—Miners	87	3.00 - 3.50	.....	.....	87	.....
Miners' helpers	113	2.50	.....	.....	113	.....
Labourers	17	2.50	87	2.25 - 2.75	104	.....
Mechanics and skilled labour	33	2.75 - 3.50	38	3.00 - 3.67½	71	.....
Boys	.....	.....	10	1.25 - 1.59	10	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Total	256	.....	145	.....	401	.....

Corbin Coal & Coke Company, Limited.

Head Office—Spokane, Wash.

Capital of Company, $1,000,000.

Officers.	*Address.*
D. C. Corbin, President,	Spokane, Wash.
J. K. O. Sherwood, Vice-President,	New York, N. Y.
A. T. Herrick, Secretary-Treasurer,	Spokane, Wash.
E. J. Roberts, Superintendent,	"
Evan Evans, Mine Manager,	Corbin, B. C.

Value of Plant, $100,000.

CORBIN COLLIERY.

Thos. Corkill, Overman; J. McAlpine and S. Richards, Firemen.

This colliery is being opened up at present, and this is being done by driving in two tunnels; the big Main tunnel is 14 by 8½ feet in the clear, and is now in 386 feet, while the small tunnel is 11 by 8½ feet, and is now in 1,700 feet. The seam is 40 feet thick and dips at an angle of about 70°. The small tunnel is 70 feet higher than the Main tunnel, and the crosscut between them makes a good natural ventilation in the Main tunnel and out the upper.

On December 10th I inspected this mine and found everything in good order; the ventilation was sufficient, there being in circulation an air-current of 37,000 cubic feet of air for use of sixty-four men and two horses. Safety-lamps only are in use, and no blasting, except in rock, is allowed. The seam varies in thickness from 9 feet to 220 feet and the dip from 60° to 90°. In places there is a good deal of crushing of the timbers, and it required a number of men to be kept timbering to keep the roadways in shape.

Copies of general and special rules and plan of the mine are kept posted up.

The following are the official returns of this colliery for the year ending 31st December, 1909:—

Sales and Output for Year.	Coal.		Coke.	
(Tons of 2,240 lbs.)	Tons.	Tons.	Tons.	Tons.
Sold for consumption in Canada	4,640			
" export to United States	55,552			
" " to other countries				
Total sales		60,192		
Used in making coke				
" under colliery boilers, etc.	632			
Total for colliery use		632		
		60,824		
Stocks on hand first of year				
" last of year				
Difference { added to / taken from } stock during year				
Output of colliery for year		60,824		

Number of Hands Employed, Daily Wages Paid, etc.

Character of Labour.	Underground.		Above Ground.		Totals.	
	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.	No. Employed.	Average Daily Wage.
		$		$		$
Supervision and clerical assistance	4	4.35	5	4.07	9	4.20
Whites—Miners	58	3.50	.....	.....	58	3.50
Miners' helpers	57	2.75	.....	.....	57	2.75
Labourers	.....	.....	10	2.50	10	2.50
Mechanics and skilled labour	.....	.....	24	3.50	24	3.50
Boys	.....	.....	.....	.....	.....	.....
Japanese	.....	.....	.....	.....	.....	.....
Chinese	.....	.....	.....	.....	.....	.....
Indians	.....	.....	.....	.....	.....	.....
Totals	119	.....	39	.....	158	3.30

Name of Seams or Pits—No. 1.

Description of seams, tunnels, levels, shafts, etc., and number of same—Seam No. 1 strikes S. 15° W.; dip, 70° to E.; thickness varying up to 200 feet. One main entry, 8 by 14 feet, 1,800 feet long (tunnel). One air-course, 9 by 12 feet, 1,750 feet long (tunnel).

Description and length of tramway, plant, etc.—Tramway: Extension of mine tracks for 800 feet from entrance of main entry to storage bins. Plant: Two boilers, locomotive type, 60 horse-power each; two boilers, horizontal tubular, 150 horse-power each; one high-pressure compressor, for haulage system, of 776 cubic feet capacity; two air locomotives, weight 19,000 lbs. each; one fan, 4 feet by 12 feet, of 5,000 cubic feet capacity; electric lighting plant, consisting of one 100 horse-power engine and one 60 k.w. a.c. generator; storage-bins of 1,500 tons capacity.

ACCIDENTS IN BRITISH COLUMBIA COLLIERIES DURING 1909.

Causes of Accident and Nature of Injury.	Name of Colliery.																								Total for 1909.			
	Nanaimo.			Union.			Extension.			Other collieries.			Middlesboro.			Crow's Nest.			Hosmer			Corbin.						
	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Fatal.	Serious.	Slight.	Total.
Gas—Explosion of	..	..	..	..	..	..	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32	..	..	39
Fatal	..	..	.	..	..	..	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	32	..	..	....
Serious	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....
Slight	..	..	2	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	.	1	..	..	7	....
Falls of Coal	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18
Fatal	..	..	..	2	..	..	2	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	7	..	..	....
Serious	..	2	..	..	1	..	..	1	..	..	..	..	..	2	..	..	1	..	..	..	..	..	..	..	..	7	..	....
Slight	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	4	....
Falls of Rock	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	28
Fatal	..	..	..	3	..	..	1	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	6	..	..	....
Serious	..	1	..	..	2	..	..	3	..	..	..	..	..	1	..	..	5	..	..	1	..	..	..	..	13	..	..	....
Slight	..	..	3	..	..	1	..	..	..	..	..	3	..	..	..	..	..	1	..	..	..	..	..	1	..	..	9	....
Mine Cars	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	47
Fatal	..	..	..	1	..	..	3	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	6	..	..	....
Serious	..	4	..	..	2	..	..	..	..	..	..	..	..	1	..	..	9	..	..	..	..	..	1	..	..	17	..	...
Slight	..	..	9	..	..	1	..	..	6	..	..	..	..	..	1	..	..	6	..	..	1	..	..	..	..	..	24	....
Shot or Powder	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5
Fatal	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	....
Serious	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	....
Slight	..	..	1	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	....
Ropes, Hoisting or Haulage	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3
Fatal	..	..	.	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....
Serious	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....
Slight	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	3	....
Post or Timber	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5
Fatal	..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...
Serious	.	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	.	2	..	....
Slight	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	3	....
Miscellaneous—Underground	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6
Fatal	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	2	..	..	. .
Serious	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	2	..	....
Slight	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	2	...
Miscellaneous—Surface	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	12
Fatal	1	..	..	..	.	..	.	..	..	1	..	..	..	..	..	..	..	..	1	.	..	..	..	..	3	..	..	....
Serious	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	5	..	....
Slight	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	4	....
Total	2	7	17	6	6	9	38	4	8	2	..	3	..	4	1	8	23	9	1	2	10	..	1	2	57	47	59	163
Number of men employed	1,191			1,274			1,030			351			145			1,868			401			158			6,418			

PER CAPITA PRODUCTION OF COLLIERIES.

	Gross tons of coal mined in 1909.	Total number of men employed by colliery.	Tons of coal mined per man employed at colliery.	Number of men employed underground in collieries.	Tons of coal mined per man employed underground.
East Kootenay District	923,865	2,427	380	2,976	532
Coast District	1,476,735	3,991	370	1,737	496
Total for Province	2,400,600	6,418	374	4,713	509

SUMMARY—TABLE SHOWING ACCIDENTS OCCURRING IN B. C. COLLIERIES IN TEN YEARS—1900 TO 1909.

For the year	1900.				1901.				1902.				1903.				1904.				1905.				1906.				1907.				1908.				1909.				Total for 10 years.			
Output of coal—tons.	1,590,179				1,691,557				1,641,626				1,481,913				1,685,698				1,825,832				1,899,076				2,219,608				2,109,387				2,400,600				18,545,476			
No. persons employ'd	4,178				3,974				4,011				4,264				4,453				4,407				4,805				6,059				6,095				6,418				48,674			
Nature of Injury. / Cause of Accident.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.	Fatal.	Serious.	Slight.	Total.
Explosion (cause unknown).	..	..	..	..	64	..	..	64	125	..	..	125	..	..	..	..	14	.	..	14	..	..	..	..	..	.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	203	..	..	203
Gas explosions	..	2	22	24	2	2	12	16	1	..	8	9	21	..	16	37	7	..	8	15	.	..	9	9	..	..	1	1	1	1	18	20	1	..	8	9	32	..	7	39	65	5	109	179
Falls of coal	2	14	3	19	6	9	2	17	1	4	1	6	4	5	2	11	5	12	1	18	2	8	3	13	5	6	3	14	8	15	7	30	3	6	10	19	7	7	4	18	43	86	36	165
" rock	6	15	3	24	6	8	4	18	7	6	2	15	8	8	4	20	4	7	1	12	4	6	1	11	7	8	7	22	2	7	8	17	5	10	7	22	6	13	9	28	55	88	46	189
Mine cars	4	7	3	14	3	5	5	13	3	6	5	14	5	7	2	14	3	15	5	23	3	9	8	20	2	13	13	28	8	22	15	45	1	19	15	35	6	17	24	47	38	120	95	253
" timber	..	1	1	2	...	2	..	2	2	..	..	2	1	2	..	3	..	2	..	2	1	2	..	3	..	1	1	2	..	4	1	5	1	3	..	4	..	2	3	5	5	19	6	30
Hoisting, ropes, &c.	1	..	..	1	...	2	..	2	...	2	..	2	..	4	1	5	..	2	..	2	..	..	1	1	..	2	1	3	..	..	3	3	1	4	..	5	..	..	3	3	2	16	9	27
Powder, &c., explo'n	1	3	6	10	..	4	6	10	...	..	1	1	1	7	..	8	1	..	1	2	1	1	3	5	..	1	1	2	1	2	4	7	..	2	4	6	1	1	3	5	6	21	29	56
Underground — Miscellaneous.	..	..	..	..	...	..	..	..	...	..	..	..	..	..	..	..	..	..	..	..	..	2	1	3	..	2	3	5	1	1	4	6	4	2	5	11	2	2	2	6	7	9	15	31
On surface — miscellaneous.	3	1	..	4	2	2	2	6	...	3	1	4	2	..	1	3	3	3	..	6	1	2	..	3	1	3	2	6	10	9	2	21	2	4	3	9	3	5	4	12	27	32	15	74
Fire in Mine	..	..	..	..	19	..	..	19	...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	.	..	.	..	.	...	..	..	..	..	..	..	..	..	19	...	...	19
	17	43	38	98	102	34	31	167	139	21	18	178	42	33	26	101	37	41	16	94	12	30	26	68	15	36	32	83	31	61	62	154	18	50	52	120	57	47	59	163	470	396	360	1226

DETAILED STATEMENT OF ACCIDENTS IN B.C. COLLIERIES DURING 1909.

COAST COLLIERIES.

REPORTED BY ARCHIBALD DICK, INSPECTOR.

No.	Colliery.	Date.	Name.	Occupation.	Details.
1	Nanaimo.....	Jan. 2	Henry Nelson Penn	Carpenter.....	Killed by falling down air-shaft.
2	No. 4 Union.....	" 14	William Delaney ..	Miner	Killed by falling coal.
3	" 6 "	" 19	William Thomson..	"	Sustained broken ribs and internal injuries by falling off a car.
4	" 4 "	" 20	Suyuma..	"	While at work, fall of rock caused compound fracture of leg.
5	Middlesboro	" 23	William Welfare ..	"	Fall of coal caused sprained hip, bruised scalp, and wound on finger.
6	Extension.....	" 27	William Cope	Motor-driver..	Killed by getting jammed between the motor and the timbering.
7	No. 4 Union	" 28	Fred. Harwood....	Miner	Slightly burned, arms and hands, by explosion of powder while charging a shot.
8	" 1 Nanaimo..	" 29	Hugh Mason	Driver.....	Wrist broken by being jammed between horse and car.
9	" 1 " ..	Feb. 7	Albert B. Wilson..	Blacksmith....	While working on washer, fell on to railway track, about 15 feet, and was killed.
10	" 4 Union	" 15	Hong Yung	Miner	After being placed in hole, powder exploded, causing wounds on face and chest (may lose sight of both eyes).
11	Middlesboro	" 24	Fred. S. Gay.....	"	Fall of coal caused broken collar-bone and injuries to back, sides, hips, and neck.
12	Extension	" 25	Julius Hegaebran..	Mule-driver...	Kicked on neck by mule.
13	S. Wellington...	Mar. 10	Henry Freeman ...	Shotlighter ...	Examining place after shot, when rock fell and bruised face and shoulder.
14	No. 2 Extension	" 22	Alex. Crawford....	Runner.....	Knocked himself against car draw-band and broke leg.
15	" 3 "	" 24	Oscar Massey	Miner	Fatally injured by fall of top coal.
16	" 3 "	" 29	Donald McAllister.	Mule-driver ..	Kicked in stomach by mule.
17	" 1 Nanaimo..	Apr. 16	Samuel Thompson .	Track-layer...	Scalp-wound by fall of rock.
18	S. Wellington...	Mar. 31	Wong Lunn.....	Labourer	Killed by runaway cars on which he was riding (not *in* mine).
19	No. 4 Union.....	Apr. 3	Quack Fung.....	Miner	Killed instantly, while loading car, by fall of roof (rock).
20	" 7 Cumberland	" 9	A. Ibbertson.....	Labourer	Foot crushed, bone broken at picking-table.
21	" 1 Nanaimo..	May 15	Edward Tomlinson.	Loader	Head and breast cut by rock from shot.
22	" 4 Union.....	" 17	Joe Wong	Miner	At work in stall, killed by falling rock.

Accidents in Coast Collieries.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
23	No. 1 Nanaimo..	May 27	John Calverlay....	Mule-driver...	Mule started suddenly, pulled car off track, jamming the man's leg.
24	" 1 " ..	" 27	Sam Brown	Winch-driver..	Guiding cars into siding, cars jumped track, crushing arm and breaking wrist against cog.
25	" 1 Extension.	June 2	Robert Baxter	Pusher	Foot crushed, caught in rope.
26	" 4 Union	" 3	Wardo McKee	Mule-driver...	Ankle broken by car jumping track and crushing against a prop.
27	" 1 Nanaimo..	June 3	James Shaw	Pusher	Finger caught between car and rail, broken.
28	" 1 " ..	" 3	Thomas Woodcock.	Miner	Was lifting stringer off car, when it fell on his foot, breaking bone.
29	S. Wellington ...	" 3	Jos. Wilkinson....	"	Rock fell on knee-cap, dislocating same.
30	No. 3 Extension	" 5	Tom Koli.....	"	Fatally injured by fall of coal.
31	" 2 "	" 7	Moses Webley	Trapper	Run over when attempting to board a train of cars and killed.
32	" 1 Nanaimo..	" 8	Arnold Eastom....	Rope-rider....	Coupling cars in motion, jammed and bruised on chest.
33	" 6 Union	" 11	Maurice Robinson .	Mule-driver...	Attempted to stop car, run over and killed.
34	" 4 "	" 11	Juji Gen.....	Mine labourer.	Killed by fall of coal.
35	" 3 Extension	" 16	Ed. Armstrong....	Miner	Was putting timbering under loose rock, which fell and fatally injured him.
36	" 3 "	" 16	Dan Campbell.....	Fireman	Two ribs broken by same fall as 35.
37	" 4 Union	" 19	Peter Arlette	Miner	Hands, arms, and neck slightly burned, approached a gassy place in his stall with naked light.
38	" 1 Nanaimo..	" 23	Robert Richardson.	Rope-rider....	Attempted to unhook cars in motion, leg was caught and jammed.
39	" 4 Union	" 30	Chow Hing.....	Mine labourer.	Both legs broken by fall of top coal.
40	No. 3 Extension	July 8	Noel A. Goskinell..	Pusher... ...	Attempted to board a moving trip, arm fractured.
41	" 4 Union.....	" 9	Mew He.....	Mule-driver...	Was about to open a door to let a trip through; trip pulled door on to him, whereby he sustained broken leg and cut head.
42	" 2 Extension	" 13	Geo. Hoggan	Rope-rider....	Collar-bone broken by a runaway trip of cars.
43	" 2 "	" 14	A. Luzen	Runner	Knocked block from a car before spragging it, sustaining thereby a broken leg. Died later from internal injuries.

ACCIDENTS IN COAST COLLIERIES.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
44	No. 1 Nanaimo..	Aug. 6	Geo. Jameson	Driver.....	Guiding two cars around switch, last car jumped track and jammed his knee against the rib.
45	" 1 " ..	" 7	Louis Vokus	Brusher	Falling rock bruised hip.
46	" 1 " ..	" 7	Henry Semple.....	Loader.....	Falling coal bruised back.
47	" 1 " ..	" 9	Alex. Honeyman...	Driver-boss....	Jammed between car and rib; back bruised.
48	" 1 " ..	" 13	James Dorran.....	Loader..... ..	Jammed between car and rib; several ribs broken.
49	" 4 Union	" 17	Hasumoto	Miner	Falling coal caused broken rib, hurt back, and bruised hip.
50	" 1 Extension.	" 17	Geo. Majoskey	"	Falling rock broke leg.
51	" 7 Union	" 19	West York.....	"	Falling rock from face caused compound fracture of leg below knee. Died 30th September.
52	" 1 Nanaimo..	" 19	Arthur Tiesu.....	Mule-driver...	Attempted to couple moving cars to standing cars, shoulder caught and collar-bone broken.
53	" 2 Extension	" 25	Jacob Alton	Miner	Missed-fire shot went off as he entered place to look at it.
54	" 3 "	" 26	Martin Dunsmuir..	"	Two stringers gave way, letting down rock, breaking his leg and shoulder-blade.
55	" 1 Nanaimo .	" 27	Richard Harrol....	Driver...	Slightly burned on arm by explosion of gas, set off by No. 57.
56	" 1 " ..	" 27	Joseph Simpson ...	Brusher	Lit gas in his place, and was burned on head, shoulders, and arms by resulting explosions.
57	" 1 " ..	Sept. 3	James Gregory	Loader	Falling rock bruised back.
58	" 1 " ..	" 14	John Dick	Labourer	Wrist broken, caught between door and car.
59	S. Wellington...	" 15	Joseph Dykes	Timberman ...	Falling rock bruised leg.
60	No. 4 Middlesboro	" 17	Donald McPhee ...	Miner	Falling rock caused lacerated finger, scalp wound, and crushing of lumbar region of spine.
61	" 1 Nanaimo..	" 23	James Lister.....	"	Falling coal broke ankle.
62	" 4 Union.....	" 23	Jung Tong.....	"	Explosion of gas burned face, hands, arms, and back. Shot had knocked brattice down, allowing a small accumulation in stall.
63	" 2 Extension	Oct. 5	William Davidson..	Driver.....	Killed by explosion of gas in mine.
64	" 2 "	" 5	Charles Salo.....	Loader	" " "
65	" 2 "	" 5	Alex. Milanich....	Labourer.....	" " "
66	" 2 "	" 5	John Ewart.....	Pusher	" " "

ACCIDENTS IN COAST COLLIERIES.—*Continued.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
67	No. 2 Extension	Oct. 5	John Bulish.....	Miner	Killed by explosion of gas in mine.
68	" 2 "	" 5	James Molyneux...	"	" " "
69	" 2 "	" 5	Mike Gustow.....	Loader.....	" " "
70	" 2 "	" 5	Edward Dunn.....	Driver.	" " "
71	" 2 "	" 5	John Wargo.....	Miner.....	" " "
72	" 2 "	" 5	Winzard Steele....	....	" " "
73	" 2 "	" 5	Robert White.....	Miner.....	" " "
74	" 2 "	" 5	Charles Scheff.....	Labourer	" " "
75	" 2 "	" 5	Todd Romlovia....	Miner....	" " "
76	" 2 "	" 5	Mike Danculovick .	.....	" " "
77	" 2 "	" 5	Herman Petterson .	Miner.....	" " "
78	" 2 "	" 5	Thomas O'Connell..	"	" " "
79	" 2 "	" 5	Thomas Thomas...	"	" " "
80	" 2 "	" 5	Andrew Moffet....	Labourer.....	" " "
81	" 2 "	" 5	W. A. Selburn	Pusher	" " "
82	" 2 "	" 5	Wm. Quinn.....	Driver.....	" " "
83	" 2 "	" 5	Harold Taylor.....	Labourer..	" " "
84	" 2 "	" 5	Geo. Bodovinac....	Miner	" " "
85	" 2 "	" 5	Alex. Kesserich ...	"	" " "
86	" 2 "	" 5	Wm. Kesserich ...	"	" " "
87	" 2 "	" 5	Fred. Ingham.....	Bratticeman ..	" " "
88	" 2 "	" 5	John Isbister.....	Track-layer ...	" " "
89	" 2 "	" 5	Alex. McLellan....	Driver.....	" " "
90	" 2 "	" 5	Peter Neiland.....	Pusher	" " "
91	" 2 "	" 5	Robert Marshall. ..	"	" " "
92	" 2 "	" 5	Wm. Robinson....	Miner	" " "
93	" 2 "	" 5	Thos. T. Parkin...	"	" " "
94	" 2 "	" 5	Oscar Imjman.....	Pusher	" " "
95	Middlesboro.....	" 16	Albert Allet	"	Thrown against rib by car, hand and arm lacerated.
96	No. 3 Extension	" 18	Steve Armanasco ..	Miner	Coal fell off rib and broke both legs.
97	" 1 Nanaimo..	" 28	Wm. Clark.....	Rope-rider	Riding between cars which jumped track, jamming him and bruising hip.

ACCIDENTS IN COAST COLLIERIES.—*Concluded.*

No.	Colliery.	Date.	Name.	Occupation.	Details.
98	No. 7 Union	Oct. 28	Richard Hudson...	Fireboss	Had instructed bratticeman to put in brattice, and went with naked lamp to inspect it. Kindled gas; burned face, neck, hands, and arms.
99	" 1 Nanaimo..	" 30	F. Gunick	Brusher	Falling rock broke his arm.
100	" 1 " ..	Nov. 4	Achie Hamah	Miner	Pulling car around curve, car jumped the track, crushing his arm against cog and breaking it.
101	" 4 Union	" 10	Yong Kong	"	Hand torn and bones broken by being caught in pulley-block.
102	Middlesboro.....	" 17	Alex. McLeod.....	Teamster	Horse stepped on his leg, breaking it.
103	No. 1 Extension.	" 22	Kashimoto	Labourer	Fell off car and injured spine.
104	S. Wellington...	" 23	Alex. Thompson...	Miner	Making up a charge of dynamite, when 80 caps exploded, injuring him so that he died later.
105	No. 4 Union	" 28	Arch. Bullman	"	Falling rock broke leg.
106	" 1 Nanaimo..	Dec. 4	Henry Campbell..	"	Falling coal broke arm.
107	" 4 Union	" 10	D. McIntosh	"	Falling rock bruised and strained back.

EAST KOOTENAY COLLIERIES.

REPORTED BY THOMAS MORGAN, INSPECTOR.

No.	Mine.	Date.	Name.	Occupation.	Details.
1	No. 5 Hosmer...	Jan. 1	Jacob Barker.....	Miner...	Slight explosion gas, burned on hands and back of head.
2	No. 8 Michel....	Feb. 15	Harry Ryan... ...	Tipple engineer	Was lubricating conveyor belt, fell in, sustained broken arm and injury to head.
3	Corbin.....	" 19	Wm. Ryan.....	Miner.....	Falling rock injured legs and back.
4	No. 8 Michel....	" 23	John Robinson	Motorman	Piece of timber fell while he was helping timberman and caused compound fracture of right leg.
5	" 3 "	Mar. 24	Warren Lattrie....	.....	Falling coal (through timbers) caused sprained back and injury to spine.
6	Coal Creek.....	Apr. 30	William Smith	.....	Thrown off horse, right leg broken.
7	No. 5 Michel....	" 9	George Belinsky...	.....	Falling rock injured head.
8	" 2 Coal Creek	May 25	Leon Gourlea.....	Loader..	Falling rock caused broken ribs.
9	" 5 "	Apr. 22	David White.....	.....	Left leg caught between car and McGinty and broken.
10	" 1 "	" 22	Mike Jaruss.....	.....	Crushed between cars, fractured rib.

Accidents in East Kootenay Collieries.—*Continued.*

No.	Mine.	Date.	Name.	Occupation.	Details.
11	Corbin.....	April 21	Nobel Gammon....	.....	Leg accidentally broken by horse.
12	No. 7 Morrissey .	May 5	John Planetta.....	.....	Fall of coal killed him.
13	" 7 "	" 5	Joe Kubie.....	.....	Same accident.
14	" 2 Coal Creek	" 20	Leon Gunlea	.....	Falling rock broke some ribs.
15	" 5 "	" 25	Mark Branch.....	.....	Putting up timber, and boom fell on him, breaking some ribs.
16	" 5 "	June 1	Ed. Aldacre.....	Boss driver....	Run over by trip of cars, killed.
17	Corbin.....	" 5	Steve Klegs.....	.....	Ignited a small quantity of gas, burned on face and fingers of left hand.
18	No. 2 Coal Creek	" 5	John Caldwell.....	Timberman ...	Died of heart disease while at work.
19	" 8 Michel....	July 2	W. Illshack.....	Pusher	Struck by runaway car, compound fracture of right leg.
20	Hosmer.....	" 8	E. Cummings.....	Teamster	Legs bruised by being run over by his wagon (outside mine).
21	"	" 9	John Miller.....	.....	While cutting wedges, cut his finger.
22	"	" 9	Harry Jay	.....	Hand bruised while handling barrels (outside mine).
23	Coal Creek.....	" 14	John Hovan.....	.....	Fell off horse, sustaining broken ribs and penetrated lung.
24	No. 5 Coal Creek	" 15	James Buhill.....	.....	Crushed between a car and wall of level, broken collar-bone.
25	Hosmer.....	" 28	S. Giacomo.....	Mine labourer.	Finger crushed while handling a timber.
26	No. 4 Michel....	" 29	J. Evans.....	.....	Arm crushed by a car.
27	Hosmer.....	" 30	Eugenie Manzagli..	Concrete labourer	Fell from a scaffolding on boilers, sustained fractured skull, died.
28	"	Aug. 5	J. Syra.	.....	Falling rock broke leg.
29	Michel.	" 9	W. Syidlensky	Miner	McGinty car ran on to him, compound fracture of leg.
30	No. 2 Coal Creek	" 20	Richard Alder.....	.....	Jumped off moving cars and sustained broken humerus, broken ribs, scalp-wound, bruised legs, arms and back.
31	" 1 Michel....	" 21	Mike Povic	.....	Falling coal killed him.
32	Hosmer.....	" 26	N. Hamon	Back-hand	Falling coal from face, sprained back, bruised leg and shoulders.
33	"	Sept. 1	S. Tyes.....	Miner	Fell down chute, broke leg.
34	No. 5 Coal Creek	" 9	Angus Salvsky	"	Riding car, crushed between roof and car, collar-bone and two ribs broken.
35	Hosmer.....	" 11	A. Wyenykor	Coke-puller ...	Fell off coke-oven, ribs and chest slightly crushed.
36	No. 5 Coal Creek	" 16	Mansel Rees	Driver.....	Falling rock caused fatal injuries.

ACCIDENTS IN EAST KOOTENAY COLLIERIES.—*Concluded.*

No.	Mine.	Date.	Name.	Occupation.	Details.
37	No. 9 Coal Creek	Oct. 18	Tom Stestar.....	Machineman ..	Falling rock broke fibula.
38	" 9 "	" 26	Owen Corigan.....	Miner.....	Fell while walking on track, broke right collar-bone.
39	" 1 "	Nov. 2	Alex. Carpuck.....	Loader.....	Falling rock broke left leg and injured head.
40	" 7 Michel ..	" 3	John Payne.....	Miner.....	Falling coal caused broken leg.
41	" 8 " ..	" 5	Harry Hudson.....	"	Fell off bench in his stall, broke left leg.
42	" 7 " ..	" 8	W. B. Cruikshanks	Hoistman.....	Crushed against rib and run over by cars, sustained fractured ribs left side and dislocated clavicle.
43	Hosmer.....	" 11	B. Swanton	Labourer.....	Finger broken while handling timber.
44	No. 8 Michel ..	" 11	D. Gri.....	Track-layer ...	Runaway cars jumped track just as they were passing him, causing concussion of brain, bruised body, and dislocated thigh.
45	Coal Creek.....	" 19	John Patterson....	.....	Crushed between locomotive and car on tipple, sustained broken arm.
46	Michel	" 24	Pete Vlasak.....	Trimmer.....	Crushed between railroad car and tipple.
47	No. 2 Coal Creek.	" 26	Paul Lovan	Driver.....	Riding on trip and fell under cars, sustained compound fracture left leg.
48	" 8 Michel....	Dec. 3	Steve Koky	Timberman ...	Falling rock killed him.
49	" 2 Coal Creek	" 10	Harry Twigg.....	Driver.....	Runaway trip knocked him down and crushed legs.
50	" 1 "	" 10	Harry Duckett	"	Crushed between timber tram and roof, sustaining broken rib.
51	" 5 "	" 13	Andrew Paton	Motorman helper	Timber tram ran off track and crushed him against cog, crushing his pelvis.
52	" 1 "	" 16	John Whuska.....	Miner	Falling rock crushed broken fibula and dislocated tibia.
53	" 1 "	" 18	Joseph Hewitson ..	Driver.....	Jumped off his trip and was run into by trip, sustaining fracture of ribs and displacement of stomach, died.
54	Hosmer.....	" 23	M. Protka	Miner	Finger crushed in block.
55	No. 9 Coal Creek	" 24	Harry Fowler	Driver.....	Little finger cut off (right hand), caught between prop and car.
56	Hosmer.....	" 27	B. Swanton	Engineer	Ran in front of motor, fractured nose and badly lacerated face.

PROSECUTIONS.

As is incumbent upon the Inspector, he has been obliged to lay information before the local Magistrates in a large number of cases for infractions, by the workmen in the mines, of the general and special rules, which are provided solely for their own protection. These regulations are for the general safety of all the underground employees, and the carelessness of one man endangers all his follow workmen, whose lives are practically in the hands of such foolishly careless or criminal person.

The following convictions have been obtained during the year for the offences noted:—

3 convictions for having matches in their possession inside a mine where safety-lamps are required to be used.

1 for sticking his pick through lamp, by placing lamp too close to swing of pick.

2 for breaking lamp underground.

1 for checking a company car of coal.

1 for stealing coal from miners.

1 for breaking windows in hoist-house.

1 for being under influence of liquor while on duty in power-house.

METALLIFEROUS MINES SHIPPING IN 1909.

:o:

CASSIAR.

ATLIN MINING DIVISION.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
State of Montana...	Rainy Hollow	Alaska Iron Co.....	384, Arcade Annex, Seattle, Wash.	Copper, silver.

QUEEN CHARLOTTE MINING DIVISION.

Ikeda Mines.....	Ikeda Bay.....	Awaya, Ikeda & Co., Ltd	Box 488, Vancouver..	Gold, silver, copper.

EAST KOOTENAY.

FORT STEELE MINING DIVISION.

North Star	Kimberley.....	N. McL. Curran	Kimberley	Silver, lead.
St. Eugene	Moyie	S. G. Blaylock.....	Moyie.....	"

GOLDEN AND WINDERMERE MINING DIVISIONS.

Hot Punch	Toby Creek.....	J. E. Stoddart..... ...	Windermere	Silver, lead.
Crown Point	McMurdo Creek	Charles Sweiberg	Golden	"

WEST KOOTENAY.

NELSON MINING DIVISION.

Alice.	Goat Mt., Creston	Guy Lowenberg	Creston.....	Silver, lead.
Arlington	Erie.....	Leslie Hill....	Nelson.....	Gold, silver.
Canadian King	"	"	"	"
Emerald	Salmo	John Waldbeser	Salmo	Silver, lead.
Fern	Hall Creek	W. C. Bayley.....	Nelson	Gold.
Hope	Salmo.....	W. A. Talbot.....	Salmo	Gold, silver, lead.
Mother Lode	Sheep Creek.....	W. W. Herzberg	47 West 34th St., New	Gold, silver.
Nugget	"	A. H. Gracey.....	Nelson .....[York	"
Poorman-Granite ...	Granite Siding....	Thomas Gongh	Williams Siding....	"
Queen....	Sheep Creek	E. V. Buckley.....	Salmo	"
Second Relief.....	Erie	.....	Erie	"
Silver King..... .	Nelson	H. V. Rudd	Nelson	Silver, copper.
Vancouver	Sheep Creek.....	Frank Unfried	"	Gold, silver.
Yankee Girl.....	Ymir.....	H. L. Rodgers.....	Ymir	Gold, silver, lead.

AINSWORTH MINING DIVISION.

Banker.....	Ainsworth	H. Giegerich	Kaslo	Silver, lead.
Bismark..... ...	, ...	Neil Mackay.....	"	"
Blue Bell.	Riondel	Canadian Metals Co. (S. S. Fowler)	Riondel.....	"
B. N. A	Kaslo Creek	L. McLean	Kaslo	"
Cork	"	Selkirk Mining Co. (A. Fournier)	"	"
Empress	London Hill.....	A. C. Van Moerkerke	Whitewater	Silver.
Highland-United ...	Ainsworth.....	J. S. Airheart	Ainsworth	Silver, lead.
Index	Kaslo Creek.....	Frank Helm.....	Kaslo	Silver, lead.
Letergo Gallagher ..	Ainsworth	A. D. Wheeler.....	Ainsworth	"
Maestro.....	"	H. Giegerich	Kaslo	"
No. 1.....	"	"	"	"
Panama	Bear Lake	"	"	Silver.
Utica	Twelve-mile	C. F. Caldwall.....	"	Silver, lead.
Wellington.....	Whitewater	W. G. Robb	"	"
Whitewater	"	S. S. Fowler.....	Riondel.....	Gold, silver, lead.
Whitewater Deep...	"	J. L. Retallack	Kaslo	

SLOCAN AND SLOCAN CITY MINING DIVISIONS.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Eastmont	Slocan	Edward Crease	Nelson	Silver, lead.
Enterprise	Ten-mile	Ed. Shannon	New Denver	"
Fisher Maiden	Silverton	George Long	Salmo	Silver, lead, zinc.
Lucky Jim	Bear Lake	A. J. Becker	Kaslo	Zinc.
Marion	New Denver	C. F. Caldwell	"	Silver, lead.
McAllister	Three Forks	W. G. Clark	Sandon	Silver, lead, zinc.
Metallic	Slocan	D. B. O'Neail	Slocan	Silver, lead.
Mollie Hughes	Slocan Lake	Julius Wolff	New Denver	Gold, silver.
Ottawa No. 5	Lemon Creek	G. H. Aylard	"	"
Ottawa	Slocan City	McPhee & McVicar	Slocan	Silver.
Ruth	Sandon	James Anderson	Kaslo	Silver, lead.
Slocan Star	"	Oscar V. White	Sandon	"
Standard	Four-mile Creek	G. H. Aylard	New Denver	"
Pay-day	Slocan	D. B. O'Neail	Slocan	"
Rambler-Cariboo	McGuigan Basin	W. E. Zwicky	Kaslo	"
Richmond-Eureka	Sandon	G. W. Davis	Sandon	"
Reco	"	J. M. Harris	"	"
Silver-Hustler	Slocan	Harry Lowe	New Denver	"
Sovereign	"	James W. Duncan	Montreal, P. Q.	"
Van-Roi	Silverton	Ernest Levy	Rossland	"
Westmount	Slocan	Ed. A. Crease	Nelson	"

TROUT LAKE MINING DIVISION.

Silver Cup	Ferguson	F. Chas. Merry	Ferguson	Gold, silver, lead.
True Fissure	"	C. H. Woolley	Trout Lake	" "
Francis & Noel	Trout Lake (City)	J. T. Lauthers	"	Silver, lead.
Morning	Rapid Creek	Ed. Mobbs	Gerrard	Silver, lead, zinc.

TRAIL CREEK MINING DIVISION.

Blue Bird	Rossland	Lyman Carter	Spokane, Wash.	Gold, silver, lead.
Centre Star	"	R. H. Stewart	Rossland	Gold, silver, copper.
Hattie Brown	"	Norman Peterson	"	Gold, silver, lead.
I. X. L.	O. K. Mountain	Evans & Brokenshire	"	Gold, silver.
Le Roi	Rossland	W. S. Pugh	"	Gold, silver, copper.
Le Roi No. 2	"	Ernest Levy	"	" "
O. K.	"	Sappala, Myers & Lof	"	" "

BOUNDARY.

GRAND FORKS MINING DIVISION.

B. C. Copper Co.	Summit Camp	J. E. McAllister	Greenwood	Gold, silver, copper.
Golden Eagle		J. A. Thomson	Vancouver	" "
Molly Gibson	Burnt Basin	J. B. Singer	Rossland	Gold, silver.

GREENWOOD MINING DIVISION.

Bounty Fr	Kettle River	T. T. Henderson	Beaverdell	Silver, lead.
Granby	Phœnix	G. W. Wooster	Grand Forks	Gold, silver, copper.
Mother Lode		J. E. McAllister	Greenwood	" "
Sally	Kettle River	Robert Wood	"	Silver, lead.
Snowshoe	Phœnix			Gold, silver, copper.

OSOYOOS MINING DIVISION.

Nickel Plate	Hedley	Gormer Jones	Hedley	Gold.

LILLOOET MINING DIVISION.

Ben d'Or	Bridge Creek	A. F. Noel	Lillooet	Gold.
Lorne	Lillooet	D. Hurley	"	"

COAST.

NEW WESTMINSTER MINING DIVISION.

Mine or Group.	Locality.	Owner or Agent.	Address.	Character of Ore.
Britannia	Howe Sound	R. H. Leach	Britannia Beach	Gold, silver, copper.

NANAIMO MINING DIVISION.

Cornell	Van Anda	G. L. Tanzer	Van Anda, B. C.	Copper, gold, silver.
Lucky Jim	Granite Bay, Valdez	Geo. Mumford	Winch Bldg., Van-	Gold, silver, copper.
Marble Bay	Texada Island	A. Grant	Van Anda [couver	" "
St. Joseph	Lasqueti Island	Percy Williams	Winch Block, Van- couver	" "

CLAYOQUOT MINING DIVISION.

Leora	Elk River	W. W. Gibson	Victoria	Gold, silver.

LIST OF CROWN-GRANTED MINERAL CLAIMS.

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CROWN GRANTS ISSUED IN 1909.

CASSIAR.

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
All Right Fract.	Atlin	David Gibb	906	45.40	Mar. 23
Bangor	"	Walter S. Brown	802	48.11	April 1
Black Hawk	"	Dan Sullivan	803	37.96	July 8
Custer	"	Tim Creedon	725	50.38	April 24
Empire	"	Walter S. Brown, Michael J. O'Conner	288	51.65	April 2
Evening	"	Tim Creedon	800	49.80	April 24
Iceland	"	Walter S. Brown	806	0.11	April 2
Kirk	"	David Gibb	905	51.65	Mar. 23
London	"	Normie Fraser	724	45.10	April 22
Mountain King	"	Dan Sullivan	729	46.06	July 8
White Horse	"	Samuel Martin Fraser	723	41.00	April 28
American Girl	Skeena	Franklin Pearce Stewart, Martin Ingersoll Stewart, Henry Ward Brightwell, John Conway, Joseph W. Williams	444	51.65	Dec. 13
Hard Money	"	Franklin Pearce Stewart, Martin Ingersoll Stewart, Henry Ward Brightwell, John Conway, Joseph W. Williams	447	49.17	Dec. 13
Independence Fract	"	Robert Nowell	222	35.35	Mar. 3
Mountain Boy	"	Franklin Pearce Stewart, Martin Ingersoll Stewart, Henry Ward Brightwell, John Conway, Joseph W. Williams	445	51.65	Dec. 13
Northern Belle	"	Franklin Pearce Stewart, Martin Ingersoll Stewart, Henry Ward Brightwell, John Conway, Joseph W. Williams	446	49.03	Dec. 13
Turner Fract	"	Alfred Edwin Bull and William Howden	221	43.34	Feb. 19
Blue Belle	Q. Charlotte	John Stanford McMillan	80	14.78	May 26
Copper Queen	"	"	77	46.63	May 26
Emma	"	"	85a	51.65	Oct. 8
Modoc	"	"	83	28.97	May 26
Ouray	"	"	84	47.61	July 22
Rico	"	"	82	40.63	July 22
Yankee Hill	"	"	331	49.42	Oct. 8
Copper Dyke	Omineca	Chas. D. Rand	1863	51.65	Aug. 1
Copper Hill	"	"	1861	46.76	July 19
Copper Mountain	"	"	1860	50.63	July 19
Countess	"	Telkwa Mines, Ltd., Non-Personal Liability	1826Rg5	51.33	Sept. 13
Duchess	"	" "	1820Rg5	42.95	Sept. 13
Iron Age	"	" "	1824Rg5	50.78	Sept. 13
Jessie	"	" "	1825Rg5	46.34	Sept. 13
Lakeside	"	Charles D. Rand	1862	51.65	July 19
Marquise	"	Telkwa Mines, Ltd., Non-Personal Liability	1821Rg5	38.35	Sept. 13
Missing Link	"	" "	1822Rg5	42.98	Sept. 13
Perhaps	"	" "	1827	45.50	Sept. 13
Princess	"	" "	1823	25.98	Sept. 13
Whistling Wind	"	Charles D. Rand	1859	51.59	July 19

EAST KOOTENAY.

B. C.	Fort Steele	William Tarrant and James Angus	8953	51.65	Aug. 17
Black Hills	"	" "	8950	51.65	Aug. 17
Bill Nye	"	Charles J. Reynolds, Arthur B. Fenwick, and Robert S. Richardson	4829	51.65	July 22
Blue Bull Fract.	"	James T. Laidlaw	7804	20.81	Feb. 23
Blue Dragon	"	James Horace King	8956	51.65	Oct. 5
Bulldog	"	Chris Kolle	8906	38.37	April 24
Columbia	"	William Tarrant, James Angus, and James Horace King	8969	42.08	Aug. 11
Graphite	"	Georgina C. Beattie	9085	39.43	April 29
Half Moon Frac	"	John P. Farrell, Sadie Farrell, Henry J. C. Stewart, Frank Bayliff, William Bird, and Norman W. Burdette	3545	46.03	April 28
Hidden Treasure	"	William Tarrant, James Angus, and James Horace King	8968	38.49	Aug. 11
High Peak	"	Chris Kolle	8905	51.65	April 26
Kenilworth Fractional	"	John E. Humphrys and John Swenson	2340	5.42	April 29
LePage	"	Charles J. Reynolds, Arthur B. Fenwick, R. S. Richardson	4830	48.98	July 22
Matterhorn	"	William Tarrant, James Angus, and James Horace King	8966	47.35	Aug. 11
Mystery	"	Robert Dewar	4058	51.65	Feb. 17
Nasby	"	Charles J. Reynolds, Arthur B. Fenwick, and Robert S. Richardson	4831	43.98	July 22
Silver Bell	"	William Tarrant	8954	39.56	Aug. 17
Wasp Fract	"	William Tarrant and James Angus	8952	34.69	Oct. 5
Yankee Girl Fract	"	" "	8951	29.78	Aug. 17

WEST KOOTENAY.

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Bodie	Nelson	William Moore	9290	37.80	Aug. 30
Boston	"	"	9291	51.65	Aug. 30
Bonanza	"	George Matthews	8342	41.66	June 23
Bona-Vista	"	Robert W. Riddell	4807	51.31	Mar. 12
Butterfly Frac	"	Jons P. Swedberg	6876	23.52	Jan. 16
Comstock	"	Ida Schwinke, Marion L. Horton, Frederick P. Drummond, and Maggie L. Fennell	8347	38.23	Aug. 3
Coyote	"	George Matthews	8343	47.74	June 23
Dominion	"	Frederick P. Drummond, Agnes Billings, Maggie L. Fennell, and Gus Schwinke	8815	12.89	Aug. 3
Double Joint	"	Joseph E. Read, Napoleon Gagnon, Ned Roy, and John Peppin	8345	38.81	Mar. 13
Eldorado	"	Hugh M. Billings, Thos. Bennett, Gus Schwinke, and Fred. P. Drummond	8346	45.55	Oct. 13
Emaral	"	Elliott M. Wilson, John Waldbeser, and Mary Waldbeser	9073	51.65	Nov. 16
Emerald Fract	"	" " "	9074	41.74	Nov. 16
Golden West	"	Frederick P. Drummond, Agnes Billings, Maggie L. Fennell, and Gus Schwinke	8816	47.19	Aug. 3
Gold Standard	"	Elliott M. Wilson and John Waldbeser	9071	51.65	Nov. 16
Independence	"	Fred. P. Drummond, Agnes Billings, Maggie L. Fennell, and Gus Schwinke	8817	51.10	Aug. 4
Iron King	"	William Moore	9289	51.65	Aug. 30
Jersey	"	Elliott M. Wilson and John Waldbeser	9070	44.04	Nov. 16
Joint	"	Joseph E. Read, Napoleon Gagnon, Ned Roy, John Peppin	8344	51.65	Mar. 12
Joint Fract.	"	Ernest Latulippe	8821	51.65	May 11
Kiruna	"	Jons P. Swedberg	6878	35.42	Jan. 16
Kiruna Fract	"	"	6877	17.13	Jan. 16
Lulu Fract	"	George Matthews	9052	17.09	Aug. 17
Morning	"	Elliott M. Wilson and John Waldbeser	9075	22.09	Nov. 17
Mother Lode Fract	"	Charles E. Bennett	8819	7.24	Aug. 6
Mother Lode	"	Frederick P. Drummond, Agnes Billings, Maggie L. Fennell, and Gus Schwinke	8818	51.65	Aug. 4
Nugget	"	George Matthews	8341	51.16	June 23
Ornoco Fract	"	Michael Egan	8051	9.63	May 26
Queen Victoria Fract	"	"	7616	13.97	April 1
Regalo	"	Robert N. Riddell	9065 G.1	51.65	Mar. 12
Rio Tente	"	Michael Egan	7614 G.1	51.26	Mar. 10
St. Eugene Fract	"	Ernest Latulippe	8820	15.69	April 1
Sunshine	"	Elliott M. Wilson, John Waldbeser, and Walde W. Mitlin	9076	46.43	Nov. 17
Virginia	"	Ida Schwinke, Marion L. Horton, Frederick P. Drummond, and Maggie L. Fennell	8348	43.46	Aug. 3
Drum Lumon	Ainsworth	Evelyn Montague Sandilands, John Rockney, and John W. Chism	7370	49.02	Dec. 30
Gold Hill	"	Robert Wm. Riddell	9063	41.15	May 25
Hub	"	Henry Giegerich	6331	43.79	Aug. 5
I. X. L. Fraction	"	D. F. Strobeck	5046	16.20	Oct. 8
Leona Fract	"	"	8131	26.31	Oct. 8
Morning	"	Evelyn Montague Sandilands, John Rockney, and John W. Chism	6818	33.11	Dec. 15
Purcel Fract	"	Robert Wm. Riddell	9064	5.43	May 25
Rex	"	Henry Giegerich	6330	39.55	Aug. 4
Rex Fract	"	"	6329	16.40	Aug. 4
Slide	"	"	6332	52.67	Aug. 5
Slide Fract	"	"	3627	11.31	Aug. 4
Alps	Slocan	William Richardson Will	9288	51.65	Aug. 6
Cuba	"	William Hoover Yawkey and Cyrus Carpenter Yawkey; William Hoover Yawkey and Augusta Lydia Yawkey as executors of the will of William Clyman Yawkey, deceased	4168	29.23	July 8
Dardanelles Fract	"	The Dardanelles and Okanagan Mining Co., Ltd	8516	3.20	Jan. 4
Fly Fract	"	" " "	8515	27.65	Jan. 4
Mentor Fract	"	Queen Dominion M. Co., Ltd. (N. P. L.)	3180	3.51	Nov 22
White Eagle	"	Benjamin Franklin Reamy and Arthur Clarence Cody	5634	51.65	Jan. 27
Clipper	Slocan City	The Westmont Silver M. Co., Ltd	8928	20.44	Feb. 17
Eastmont	"	" "	8924 G.1	51.65	Feb. 17
Eastmont Frac	"	" "	8927 G.1	9.33	Feb. 17
Fram	"	Edward F. Gigot as trustee for the Governor & Company of Adventurers of England trading into Hudson's Bay	9273	26.73	July 7
Lily G	"	The Westmont Silver Mining Co., Ltd	8930	13.27	Feb. 17
Marmion	"	Robert Randolph Bruce	4975	39.71	Nov. 15
Maryland	"	"	4976	24.66	Nov. 15
Nansen	"	Edward F. Gigot as trustee for the Governor & Company of Adventurers of England trading into Hudson's Bay	9274	29.58	July 8
Oddfellow	"	Westmont Silver Mining Co., Ltd	8926	37.77	Feb. 17
Westmont	"	" "	8929	11.45	Feb. 17
White Cloud	"	" "	8925	41.57	Feb. 17
White Cloud Fract	"	" "	8931	16.00	Feb. 17
Yankee Girl Frac	"	" "	8935	16.14	Oct. 5
Big Hope No. 2 Fract	Trout Lake	Charles John Allen Newton Padley	8251	26.56	Jan. 5
Iron Mast	"	Archer Martin and John Beaton McKenzie	8293	51.65	Mar. 24
Maymie Mack	"	" "	8291	51.65	Mar. 24
Mina R	"	John Beaton McKenzie	8292	39.09	July 2
Kingston	Lardeau	United Kingston Gold M., Ltd. (N. P. L.)	6558	16.40	Aug. 31
Maggie R	"	" "	6553	32.81	Aug. 31
Pittock Frac	"	" "	6559	39.10	Aug. 31
Vivian's Luck No. 1	"	Hector Povrier and George Johnson	5936	47.43	Nov. 18
Vivian's Luck No. 2	"	" "	5937	57.54	Nov. 18
Vivian's Luck No. 3	"	" "	5938	20.87	Nov. 18

WEST KOOTENAY.—*Concluded.*

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Vivian's Luck No. 4.	Lardeau	Hector Puvrier and George Johnson	5939	32.26	Nov. 18
Vivian's Luck No. 5.	"	" "	5940	43.21	Nov. 18
Senator	"	United Kingston Gold Mines, Ltd. (N. P. L.)	6554	45.80	Aug. 31
Tongue	"	" "	6555	15.50	Aug. 31

BOUNDARY.

Minnehaha	Trail Creek	Fred. R. Blockberger	5724	37.20	Nov. 15
Portland	"	"	5725	51.65	Dec. 15
Rockingham Fract	"	Le Roi No. 2, Ltd	1434	0.204	Mar. 24
Colorado Boy	Grand Forks	Samuel McOrmond	781S.	49.47	April 2
Ethel Verne Fract	"	John Mulligan	3170	15.00	Nov. 15
Excelsior	"	Seymour Birch	856S.	50.40	July 10
Exchange	"	Peter W. McGregor and Seymour Birch	854S.	47.45	July 10
Greenwood	"	Seymour Birch	855S.	47.07	July 22
Helston	"	Thomas Henry Richards and William Allen	592S.	35.45	Aug. 13
Iron Cap	"	Maggie M. Kerman	929S.	47.24	Dec. 14
Lark	"	George F. Raulston	852S.	42.69	May 6
May	"	I. J. Evans	1409	48.45	Dec. 16
Monarch Fract	"	Granby Consolidated M. S. P. Co., Ltd	562S.	0.39	July 13
Montana	"	Seymour Birch	853S.	29.42	July 14
Oro Denoro	"	John Mulligan and James F. Cunningham	149S.	4.06	July 7
Princess Louise	"	Samuel McOrmond	1224	51.65	June 21
Silverton Frac	"	Lake D. Wolford	962S.	51.38	Mar. 16
St. Lawrence Fract	"	"	963S.	14.86	Mar. 16
Summit	"	William Yolen Williams and Wellington S. Harris	1007S.	36.38	Aug. 17
V. A. Fract	"	Lake D. Wolford	964S.	27.53	Mar. 16
Alaska	Greenwood	Joseph T. Kelly and Kate T. Mackenzie	2938	48.72	Oct. 22
Balsam Fract	"	Dougald McInnis, George Wallace Rumberger, and Thomas Roderick	3296	12.78	July 15
Bell Flower	"	George Arthur Rendell, Ellen Hallett, Spencer Benerman	3151	51.65	April 22
Bristol Boy	"	James Edward Shon	2586	40.80	Mar. 24
Buster	"	Joseph P. Kelly and Kate T. Mackenzie	2937	50.52	Oct. 22
Cabot Fract	"	Dougald McInnis, George Wallace Rumberger, and Thomas Roderick	3301	1.44	July 10
Clatawa No. 2	"	Edward H. Mortimer	3651	36.55	Mar. 16
Columbus	"	James F. Cunningham, William T. Smith, and Edward T. Roberts	355S	42.58	Aug. 17
Columbus Fract	"	Dougald McInnis, George Wallace Rumberger, and Thomas Roderick	155	45.20	July 13
Dynamite	"	Richard Garves Sidley	767	51.65	April 26
"45"	"	John Mulligan	3160	30.00	Aug. 12
"44"	"	"	3159	7.07	Aug. 12
Gem Fract	"	The Granby Cons. M. S. & P. Co., Ltd	583S.	8.10	Aug. 13
Grand View Fract	"	Bertha C. Thomet, Executrix of the Estate of Thomas Ludwig Thomet, deceased	459S.	51.43	Dec. 13
Granite Mountain	"	James Sullivan and Jerry Driscoll	779S.	39.39	Jan. 22
Iron King	"	" "	780S.	47.86	April 28
Little Frank	"	Joseph J. McDonell	167S.	50.28	Oct. 28
Little Home Fract	"	"	170S.	40.37	Nov. 9
Mavis	"	Edmund T. Wickwire	2877	38.22	Nov. 10
Mayflower Fract	"	Dougald McInnis, George Wallace Rumberger, and Thomas Roderick	3302	48.44	July 10
Mountain Belle	"	Robert Wood, Samuel S. Fowler, and Thomas Curry	2272	49.70	July 29
Murray Fract	"	David Olney and Thomas Russell	1718S.	34.17	Oct. 11
Number One	"	Isaac Hoyt Hallett, James Moran, Murdock McIntyre, and Alexander McDonald	1845	51.15	Aug. 12
No. 4	"	Murdock McIntyre	1843	51.65	April 26
No. 3	"	Isaac Hoyt Hallett, James Moran, Murdock McIntyre, and Alexander McDonald	1846	46.81	Dec. 16
Number Two	"	Isaac Hoyt Hallett, James Moran, Murdock McIntyre, and Alexander McDonald	1844	51.65	Dec. 16
Old Guard	"	John Peter McLeod, Administrator of the Estate of Alexander Wallace, deceased	1644	50.82	Dec. 27
Pandre	"	Samuel T. Larsen and Alexander D. MacIntyre, Official Administrator, Administrator of the Estate of Edward James, deceased, intestate	2661	48.65	Dec. 13
Pilot Frac	"	Thomas Roderick, James Marshall, James McNulty, and Dan Bresnahan	3306	41.92	Aug. 13
Springdale	"	Edmund T. Wickwire	2787	45.50	Aug. 17
Starveout	"	Ola Lofstad, John D. Spence, Sydney M. Johnson, George D. Cunningham, John Robert Brown, and Arthur C. Sutton, Official Administrator, Administrator of the Estate of Robert Donagin, deceased, intestate	2944	21.85	Aug. 18
Wonderful	"	Wellesly Fraser, Duncan Buchanan, and Mark Christenson	169S.	51.65	Dec. 13
Badger	Osoyoos	Lytton W. Shatford, Thomas D. Pickard, Isaac L. Deardorff	389S.	13.40	Jan. 19
Beaver	"	" " "	034S.	25.10	Feb. 23
B. C.	"	John J. Marks, Thomas H. Marks, James Murphy, and Paul Brodhagen	903S.	48.52	Feb. 8
Dividend A.	"	Robert Gaede	3431	51.65	Feb. 9
Dividend Fraction Fractional	"	"	3436	22.58	Feb. 9
Dividend No. 1 A	"	"	3430	38.41	Feb. 9
Dividend No. 3 Fract	"	"	3433	49.89	Feb. 9

BOUNDARY.—*Concluded.*

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Dominion	Osoyoos	Alexander Ford	679S.	51.65	Dec. 6
Eagle's Nest No. 2	"	Thomas Bradshaw	844	51.65	Dec. 13
Golden Zone	"	John J. Marks, Thomas H. Marks, James Murphy, and Paul Brodhagen	904S.	29.35	Feb. 8
Horn Silver	"	Israel Wood Powell	1928	55.61	Oct. 5
Irish Boy	"	John J. Marks, Thomas H. Marks, James Murphy, and Paul Brodhagen	902S.	51.40	Feb. 8
Northern Light Frac	"	Horatio James Duffy, George H. Wilkinson, Frank Tarrant	3039	39.39	Jan. 14
P. S. Fract	"	Charles de Blois Green	2008.	28.07	April 24
Silver Bell	"	John J. Marks, Thomas H. Marks, James Murphy, and Paul Brodhagen	905S.	41.98	Feb. 8
Union Fract	"	Horatio James Duffy, George H. Wilkinson, Frank Tarrant	801	51.49	Jan. 14
Evening Star	Vernon	The Fire Valley G. M. Co., Ltd. (N. P. L.)	3768 G 1	45.27	Feb. 15
Mascot	"	" "	3767 G 1	36.56	Feb. 15
Rossland	"	" "	3766 G 1	45.57	Feb. 15
Alpha	Similkameen	Francis William Groves and Eric E. Jackson	937S.	51.65	Feb. 23
Brooklyn	"	Hannibal L. Jones, Frank S. Burr, Edgar E. Burr, Albert E. Howse	236	42.66	Aug. 13
Cabin	"	Freida E. Baker	474S.	51.65	Oct. 4
Colorado Fract	"	Theodore T. Burkhart	476S.	48.85	Oct. 4
Edward Fract	"	Frieda E. Baker	481S.	50.76	Oct. 4
Frieda	"	"	475S.	49.10	Oct. 4
Key West	"	Edgar E. Burr, Hannibal L. Jones, Thomas Charles Revelly, and Ashton D. Cowls	402 G 1	7.10	Oct. 5
Lela	"	Edgar E. Burr, Hannibal L. Jones, and Ashton D. Cowls	401 G 1	50.56	Oct. 5
No. 6 Fractional	"	Theodore T. Burkhart	477S.	51.53	Oct. 4
No. 7 Frac	"	Frieda E. Baker	478S.	43.56	Oct. 4
No. 26 Frac	"	"	479S.	47.03	Oct. 4
No. 27 Fract	"	Theodore T. Burkhart	480S.	37.05	Oct. 4
Catamount Fract	Nicola	William Murray	1524	1.06	Oct. 13
Laconb	"	"	1515	49.76	Oct. 20
Trapper	"	"	1516	51.65	Oct. 13
Albany	Lillooet	Frederick James Proctor, William Lewis, Thomas William Strange, and Mary Ann Williams	2163	48.32	Dec. 6
Countless	"	William George C. Manson	1177	44.30	Oct. 9
Iron Hat	"	Thomas Pickworth Lake and Thomas Turner Scott	2162	51.42	Dec. 13

VANCOUVER ISLAND AND COAST.

Dora	Alberni	Edward E. Leason	331	31.00	Oct. 16
Black Bear	Clayoquot	John Irving	293	48.10	June 24
Cinnamon Bear	"	John Irving and Carl Sundvall	294	50.60	June 24
Glengarry	"	James Dunsmuir and Clarence Dawley	410	32.70	Aug. 13
Grisley Bear	"	John Irving and Carl Sundvall	300	32.20	July 30
Stormont	"	James Dunsmuir and Clarence Dawley	411	32.70	Aug. 11
Texas	"	James Dunsmuir and Clarence Dawley	412	16.50	Aug. 13
Columbia	Nanaimo	British-American Mining Co., Ltd.	58	25.61	Mar. 23
Hayden Boy	"	Mary King	803 Rg 1	47.30	Jan. 13
Holly	"	British-American Mining Co., Ltd.	56	51.65	Mar. 23
Martle	"	Michael King	804 Rg 1	51.65	Jan. 14
Maud Adams	"	British-American Mining Co., Ltd.	57	31.32	Mar. 23
Grip on Iron	Victoria	John Bentley, John W. Fisher, John Berryman, Thomas J. Plimley, Wilfred St. G. Mitchell, Administrator of the Estate of James Mitchell, deceased, intestate; Carl Strongson, Executor, and Mary H. Shore, Executrix of the will of Sidney Shore, deceased; Alvin Engvick, John W. McGregor, Thomas E. Meade, Charles C. Cooper, Alfred Deakin, Harrie G. Ross, and William Wilson	209	40.23	Nov. 1
Iron King	"	" " "	212	28.57	Nov. 10
Iron Master	"	" " "	210	37.06	Nov. 1
Iron Master's Son	"	" " "	211	41.40	Nov. 1
Iron Prince	"	" " "	213	51.65	Mar. 10
King Solomon	"	James Humes	17 G	43.75	Dec. 15
Queen of Sheba	"	"	17 G	40.00	Dec. 15
Barbara Fract	N. Westminster	Empress Mining Co., Ltd.	1918	13.43	Mar. 11
Chicago	"	Edward Murphy and Ira Furry, Administrator of Estate of Oliver Furry, deceased, intestate	2187	51.65	Feb. 17
Deep Creek	"	John S. Grant	2594 A	50.26	July 14
Emperor Fract	"	Empress Mining Co., Ltd	1939	7.97	Mar. 11
Evening Star	"	Richard Edward Cooper	1633 A	31.48	Jan. 28
Fair West	"	Edward Murphy and Ira Furry, Administrator of the Estate of Oliver Furry, deceased, intestate	2191	51.57	Feb. 18
Hard Cash	"	James B. Kay	2161	41.29	May 22
Hunter's Best	"	Edward Murphy and Ira Furry, Administrator of the Estate of Oliver Furry, deceased, intestate	2188	51.58	Feb. 17
Joe Dawk	"	Barger Wilberg	2591 A	51.64	July 19
London	"	Alfred P. Barnfield	2160 G 1	51.51	May 22
Mayflower	"	Frederick Harrison Wiggins	2592 A	22.50	July 14
Olympic	"	Carl Bowman	1634 A	51.65	June 25
Panther	"	Britannia Copper Synd., Ltd. (N. P. L.)	2346	48.47	June 25
Queen	"	Empress Mining Co., Ltd	1928	51.65	Dec. 28
Raven	"	Albert Ward	2362 G 1	37.82	Jan. 14
Royal Edward	"	Frederick James Proctor, William Lewis, Thomas William Strange, and Mary Ann Williams	2159 G 1	43.89	May 22

VANCOUVER ISLAND AND COAST.—*Concluded.*

Claim.	Division.	Grantee.	Lot No.	Acres.	Date.
Sunshine	N. Westminster.	Thomas S. Annandale	2590 A	51.65	July 14
Wild Rose	"	Edward Murphy and Ira Furry, Administrator of the Estate of Oliver Furry, deceased, intestate	2189	51.65	Feb. 17
Wild Rose Fract	"	" " "	2190	2.35	Feb. 18
Victoria	"	Empress Mining Co., Ltd	1927	51.65	Dec. 28
Yellow Copper	"	Robert Kilpatrick	2593 A	24.93	July 14

DEPARTMENT OF MINES.

VICTORIA, B. C.

HON. RICHARD MCBRIDE,	*Minister of Mines.*
R. F. TOLMIE,	*Deputy Minister of Mines.*
WM. FLEET ROBERTSON,	*Provincial Mineralogist.*
HERBERT CARMICHAEL,	*Provincial Assayer.*
D. E. WHITTAKER,	*Assistant Assayer.*
F. H. SHEPHERD,	*Chief Inspector of Mines, Nanaimo.*
ARCHIBALD DICK,	*District* " "
THOMAS MORGAN,	" " *Cranbrook.*
JAMES MCGREGOR,	" " *Nelson.*

GOLD COMMISSIONERS AND MINING RECORDERS.

Mining Divisions.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Atlin Mining Division	Atlin	J. A. Fraser	John Cartmel	
Sub-office	Discovery City			R. Webster.
"	Telegraph Creek			Jas. Porter.
"	Summit Station			Geoffrey Butler.
"	Wynnton			W. H. Simpson.
"	Pleasant Camp			T. H. Alcock.
"	Haines (U. S.)		(Com. for taking Affidavits)	Risdon M. Odell.
Stikine Mining Division	Telegraph Creek	Jas. Porter	Jas. Porter	
Liard "	"	"	"	
Skeena Mining Division	Prince Rupert	J. H. McMullin	J. H. McMullin	
Sub-office	Kitimat			Geo. L. Anderson.
"	Port Simpson			J. R. C. Deane.
"	Essington			Neil McDonald.
"	Stewart (Portland Canal)			Robt. M. Stewart.
"	Unuk River			Burt E. Daily.
"	Hartley Bay			Ed. McCoskrie.
Bella Coola Mining Div.	Prince Rupert	J. H. McMullin	J. H. McMullin	
Sub-office	Bella Coola			Chris. Carlson.
Queen Charlotte Min'g D.	Jedway	E. M. Sandilands	E. M. Sandilands	
Sub-office	Skidegate			A. J. Gordon.
"	Masset			C. Harrison.
"	Lockeport			H. L. Beresford.
Omineca Mining Division	Hazelton	William Allison	Jas. E. Kirby	
Sub-office	McConnell Creek			
"	Fort Grahame			Wm. Fox.
"	Fort St. James			Alex. C. Murray.
"	Manson Creek			Ezra Evans.
"	Copper City			P. R. Skinner.
"	Aldermere			R. Gale.
"	Lorne Creek			F. E. Holt.
"	Kitselas			J. H. Patterson.
Peace River Mining Div.	Fort St. John			F. W. Beatton.
Cariboo Mining Division	Barkerville	Geo. J. Walker	R. S. C. Randall	
Sub-office	Quesnel			David H. Anderson.
Quesnel Mining Division	150-Mile House	Geo. J. Walker (at	Barkerville)	C. W. Grain.
Sub-office	Quesnel			David H. Anderson.
"	Quesnel Forks			
Clinton Mining Division	Clinton	F. Soues	F. Soues	
Lillooet "	Lillooet	Caspar Phair	Caspar Phair	

GOLD COMMISSIONERS AND MINING RECORDERS.—*Concluded.*

Mining Divisions.	Location of Office.	Gold Commissioner.	Mining Recorder.	Sub-Recorder.
Kamloops Mining Division	Kamloops	E. T. W. Pearse	E. Fisher	
Ashcroft "	Ashcroft	" (at Kamloops)	H. P. Christie	
Nicola "	Nicola	E. Fisher	W. N. Rolfe	
Yale "	Yale	"	Wm. Dodd	
Similkameen "	Princeton	Hugh Hunter	Hugh Hunter	
Sub-office	Hedley			F. M. Gillespie.
Vernon Mining Division	Vernon	L. Norris	H. F. Wilmot	
Greenwood Mining Div.	Greenwood	W. G McMynn	Geo. Cunningham	
Sub-office	Vernon			H. F. Wilmot.
"	Rock Creek			H. Nicholson
"	Beaverdell			F. F. Ketchum.
Grand Forks Min. Div.	Grand Forks	S. R. Almond	S. R. Almond	
Osoyoos Mining Division	Fairview	J. R. Brown	Ronald Hewat	
Sub-office	Olalla			A. Moyes.
"	Hedley			F. M. Gillespie.
Golden Mining Division	Golden	E. J. Scovil	F. H. Bacon	
Windermere "	Wilmer		G. F. Stalker	
Fort Steele Mining Div.	Cranbrook	J. F. Armstrong	J. F. Armstrong	
Sub-office	Steele			Joseph Walsh.
"	Fernie			J. S. T. Alexander.
"	Moyie			Fred. J. Smyth.
"	Marysville			
Ainsworth Mining Div	Kaslo	E. E. Chipman	R. J. Stenson	Wm. J. Green.
Sub-office	Howser			W. Simpson.
"	Trout Lake			F. Mummery.
Slocan Mining Division	New Denver	E. E. Chipman (at	Angus McInnes	
Sub-office	Sandon	" Kaslo)		W. J. Parham.
Slocan City Mining Div.	Slocan City		Howard Parker	
Trout Lake Mining Div.	Trout Lake	E. E. Chipman	F. Mummery	
Nelson Mining Division	Nelson	W. F. Teetzel	W. F. Teetzel	
Sub-office	Creston			Guy Loewenberg.
"	Ymir	Nelson)		J. A. Fraser.
Arrow Lake Min. Division	Nakusp	W. F. Teetzel (at	Walter Scott	
Sub-office	Vernon	L. Norris	H. F. Wilmot	
Revelstoke Mining Div.	Revelstoke	Robt. Gordon	W. E. McLauchlin.	Edward Edwards.
Lardeau Mining Division.	Camborne	" (at Revelstoke)	B. E. Drew	
Trail Creek Mining Div.	Rossland	John Kirkup	J. E. Hooson	
Nanaimo Mining Division	Nanaimo	George Thomson	George Thomson	
Sub-office	Ladysmith			N. A. Morrison.
"	Alert Bay			R. Woollacott.
"	Van Anda			Geo. R. McLeod.
"	Rock Bay			A. C. Minty.
Alberni Mining Division	Alberni	H. C. Rayson	H. C. Rayson	
Clayoquot "	Clayoquot	" (at Alberni)	W. T. Dawley	
Quatsino "	Quatsino	" "	O. A. Sherberg	
Victoria Mining Division	Victoria	R. A. Renwick	G. V. Cuppage	
New Westminster Min. D.	New Westminster	S. A. Fletcher	John Mahony	
Sub-office	Vancouver			A. Haslam.
"	Harrison Lake			L. A. Agassiz.
"	Chilliwack			J. Pelly.

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